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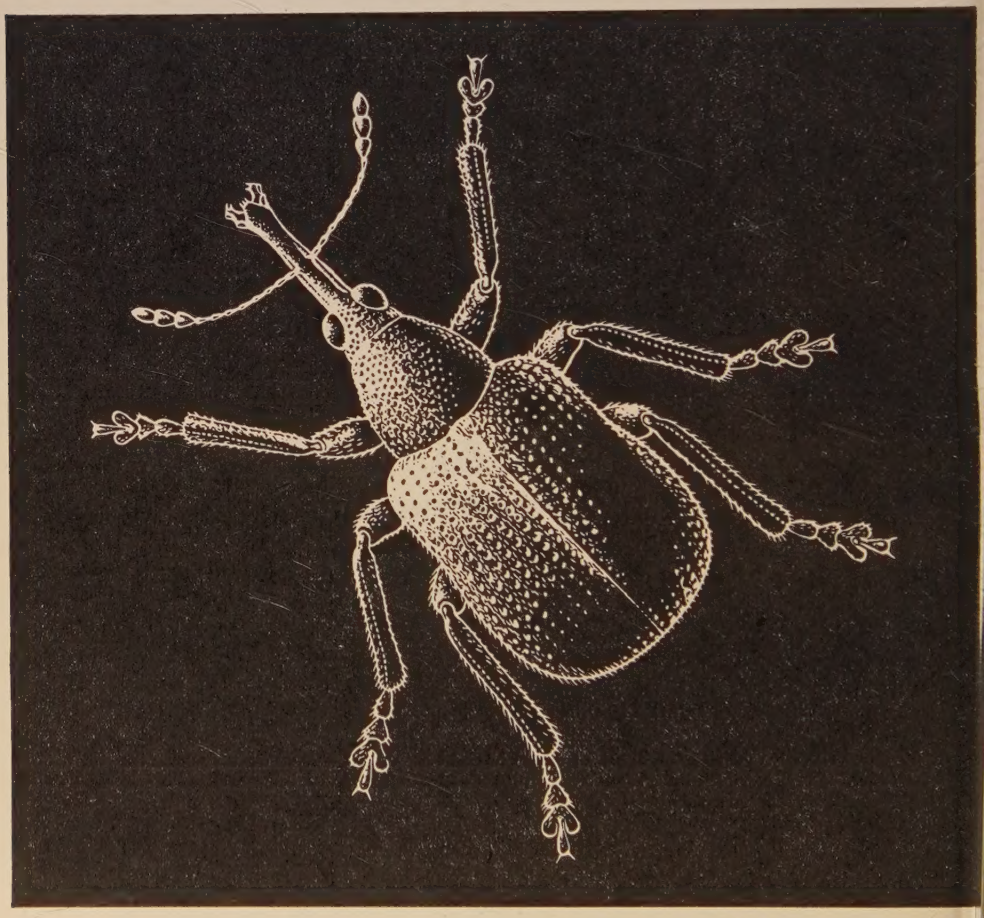

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JEANNEL (R.). **Introduction to entomology.** Translated by H. Oldroyd.—$9\frac{1}{4} \times 6$ in., 344 pp., col. frontis., 35 pls. (10 col.), 150 figs. London, Hutchinson & Co., Ltd., 1960. Price £3 3*s*.

This book on comparative entomology consists of three main parts, each occupying about a third of the space. The first, on general anatomy and classification, contains sections on the origin and systematic position of insects, their external morphology and internal anatomy, the development of insects, and their classification down to orders and sub-orders. The second part is concerned with insect biology, the three main topics considered being physiology, behaviour and social life, and the third deals with palaeontology, including the evolution of insects and the classification of fossil insects, and the way in which insects spread over the earth, with information on the succession of insect faunas and the natural regions into which the world is divided.

ORIAN (A. J. E.). **Report on a visit to Diego Garcia.**—*Rev. agric. sucr. Maurice* **38** no. 3 pp. 127–143, 3 pls., 42 refs. Port Louis, 1959.

The production of copra is the main industry of Diego Garcia, in the Chagos Archipelago, but the yield of coconuts is decreasing. Information, based on observations made in October 1958, is given on the various causes of the decline, together with recommendations for improvement, descriptions of the topography and climate of the atoll, the vegetation characteristic of natural and planted coconut groves and methods of cultivation, and very brief notes on pests of other crops. The decline in yield is attributed in part to the age of the natural groves and the depredations of rats, but chiefly to infestation by *Oryctes rhinoceros* (L.). This Dynastid, which was introduced before 1939, probably in 1914–18, destroyed about one-third of the seedlings used in an intensive replanting campaign in 1957. Its life-cycle and habits are summarised, chiefly from the literature. The adults are present throughout the year, but are most abundant from January to May; 40–100 larvae have been found in pieces of coconut stem a few feet in length. An early attempt at biological control by the introduction of *Scolia ruficornis* F. was unsuccessful, but a further introduction was made in November 1951, when 89 females and six males from Zanzibar were released. Recoveries were made in 1956, and about 100 adults were collected from two points in October 1958. There was little effect on populations of *O. rhinoceros*, however, and a campaign of hand-collection and destruction of the eggs, larvae and adults was accordingly initiated. Recommended control measures comprise the treatment of the crowns of young palms and plugging the holes from which adults have been removed with a mixture of sawdust and BHC [*cf. R.A.E.*, A **44** 419], treatment of compost and dung heaps with BHC, the destruction of dead coconut trunks (which are often left as trap logs but serve as foci of infestation) and débris, and the introduction of insect predators [*cf.* **44** 420; **48** 311]. Other pests of coconut present are *Aspidiotus destructor* Sign., which appears to have caused the death of a few palms and against which the introduced Coccinellid, *Chilocorus nigritus* F., though established in small numbers, is ineffective, *Chrysomphalus ficus* Ashm., *Pseudococcus* sp. and *P. adonidum* (L.). Various diseases of the palms are also noted.

GOONEWARDENA (H. F.). **The rhinoceros beetle** (*Oryctes rhinoceros* **L.) in Ceylon. Part I. Introduction, distribution and life history.**—*Trop. Agriculturist* **114** no. 1 pp. 39–60, 22 figs., 5 refs. Peradeniya, 1958.

Oryctes rhinoceros (L.) has long been a pest of coconut in Ceylon. Its recorded distribution is briefly summarised, its habits and various stages

are described, and studies on its life-history in the laboratory are recorded. When fed on coconut petioles, the females laid 14–27 eggs each in 4–10 days. Up to 90 per cent. of the eggs hatched, and the larvae, which were kept in a dung mixture, passed through three instars and pupated in cells at the sides of the beakers. The egg stage, the three larval instars, the prepupal stage and the pupal stage lasted 7–12, 13–23, 16–21, 72–103, 4–8 and 16–21 days, respectively, and the adults survived for 65–112 days, total length of life from egg to death averaging 244 days.

NIRULA (K. K.), ANTONY (J.), SAHASRANAMAN (K. N.) & MENON (K. P. V.). **Retentive toxicity of the field weathered insecticide to the Eulophid parasite (*Trichospilus pupivora* Ferr.) associated with *Nephantis serinopa* Meyr.**—*Indian Cocon. J.* **11** no. 4 pp. 124–132, 2 figs., 7 refs. Ernakulam, 1958.

Nephantis serinopa Meyr. on coconut on the west coast of India is normally controlled by parasites and predators [*cf. R.A.E.*, A **47** 382] and outbreaks are usually only sporadic, but infestation has in recent years become continuous. In view of the widespread use of sprays of DDT and BHC against this pest, their toxicity to *Trichospilus pupivora* Ferrière, an important parasite of the pupae [*cf.* **29** 620], was investigated in 1954 and 1955. Leaflets from palms that had been sprayed at periods ranging from one hour to eight weeks previously with these insecticides at 0·2 per cent. (the minimum effective concentration [*cf.* **43** 231; **47** 383]) were placed singly under cork sheets, each with a central oblong aperture 16 sq. cm. in area, which were held between glass plates, and adult parasites that had emerged in the laboratory were exposed to them in groups of 15 in the cavities so formed. Mortality counts were made every hour for 12 hours and then after 24, 48 and 72 hours, during which the temperature ranged from 25 to 30°C. [77 to 86°F.]. DDT was still toxic after eight weeks, although an exposure period of 72 hours was required to give 50 per cent. mortality. BHC reached a similar low degree of toxicity after only 5–6 days, but its action was rapid until after the second day, on which it caused 50 per cent. mortality after an average exposure period of 6·25 hours. Neither spray affects the immature stages of the parasite, which are passed within the host. BHC is harmless to adult parasites emerging six days after application, but in earlier experiments it lost its toxicity to *Nephantis* after only ten days [*cf.* **47** 383], and cannot therefore be recommended. In a discussion of measures whereby DDT can be rendered less harmful to the parasite, its application to strips of trees, its use during September and April, when the parasite is scarce or absent, and not during December–January, when it is abundant, and the cultivation of crops attacked by the many alternative hosts of *T. pupivora* are suggested.

MARAMOROSCH (K.). **Cross protection between two strains of corn stunt virus in an insect vector.**—*Virology* **6** no. 2 pp. 448–459, 24 refs. New York, N.Y., 1958.

The experiments described were carried out with two strains of corn stunt virus found in maize in Mexico, with *Dalbulus maidis* (DeLong & Wolc.) and *D. elimatus* (Ball) as the vectors, and the results have been noticed from a briefer account [*R.A.E.*, A **46** 493].

VAN DINTHER (J. B. M.). **Insect pests of cultivated plants in Surinam.**—*Bull. agric. Exp. Sta. Suriname* no. 76, 159 pp., 84 figs., 6 pp. refs. [Paramaribo] 1960; also as *Meded. Lab. Ent. Wageningen* no. 43.

This work, which is based on the literature, museum specimens and the author's own investigations, consists essentially of a survey of the insects that attack cultivated plants or stored products in Dutch Guiana, or are parasitic or predacious on such insects, with information on the plants, insects or other food attacked, the appearance, habits and distribution of the insects, and sometimes methods of control.

CALCAGNOLO (G.). **Os laranjais paulistas estão sendo prejudicados pelo ataque de mais uma espécie de ácaro.** [Orange trees in São Paulo are being damaged by the attack of still another species of mite.]—*Biológico* **25** no. 2 pp. 33–38, 1 ref. São Paulo, 1959.

Inspection of orange trees at several places in the State of São Paulo, Brazil, revealed sporadic but severe infestation of the developing fruits by *Hemitarsonemus latus* (Banks). The various stages of this mite, its habits, and the damage caused are described. It was previously known as a pest of other plants in the State, but not of *Citrus*. Sulphur sprays had given good control in some cases; materials that have proved effective on other crops are noted.

DAVID (W. A. L.). **The systemic insecticidal action of paraoxon on the eggs of** *Pieris brassicae* **(L.).**—*J. Ins. Physiol.* **3** no. 1 pp. 14–27, 4 graphs, 24 refs. London, 1959.

The following is virtually the author's summary. When cabbage plants bearing eggs of *Pieris brassicae* (L.) were watered at the roots with paraoxon in greenhouse experiments, the eggs failed to hatch although the larvae within them developed apparently normally [*cf. R.A.E.*, A **42** 143]. The eggs were also killed when laid on turnip and mustard plants, and there was some effect on eggs laid on broad beans [*Vicia faba*]. The eggs of two other species of Lepidoptera were not affected.

The poison reached the eggs through the point of attachment to the leaves. No appreciable fumigant action occurred since eggs lying loosely on the leaves hatched normally. Paraoxon was demonstrated in the leaf wax, and a material toxic to larvae of *Aëdes aegypti* (L.) was found in the fluid contents of the eggs on treated plants.

Cholinesterase activity could be detected in homogenates of the developing *Pieris* eggs after the second to third day. The level of activity was always lower in eggs from treated than from control plants, showing that an inhibitor was present in the eggs from treated plants.

A material active on muscle preparations was detected in the eggs after the fourth day. This was shown to be acetylcholine and more was always present in eggs from treated than from control plants. The concentration difference was greatest at the time the eggs were due to hatch. The evidence suggests that ultimately it was the high acetylcholine content of eggs from treated plants that was responsible for their failure to hatch.

KLOMP (H.). **On the theories of host-parasite interactions.**—*Arch. néerl. Zool.* **13** no. 1 pp. 134–145, 19 refs. Leiden, 1958.

The following is virtually the author's summary. The theories of host-parasite interactions of Thompson and Nicholson [*cf. R.A.E.*, A **46** 392, etc.] are discussed. The first theory makes the initial assumption that both host and parasite lay a fixed number of eggs. Nicholson, on the other hand, assumes that only the host produces a fixed number of progeny, the number of eggs laid by the parasite being dependent on host density. Further, both theories assume that the host is attended by a single specific parasite (Thompson and Nicholson) or more, and also non-specific (polyphagous) parasites (Nicholson). In nature, however, the system will always be more complex, and both host and parasite will be influenced by other mortality factors. Moreover, the effect of these factors changes from generation to generation.

When fluctuating mortality factors operate in a Thompson parasite-host system, the inevitable disturbance of the steady state leads to infinite increase of the host or to extermination, the result being dependent on the properties of the mortality factor. This is illustrated in the text with some arithmetical examples. Thus, Thompson's theory does not in fact provide a basis for a host-parasite system in fluctuating balance, owing to the initial assumption that the number of eggs laid by the parasite is fixed and unrelated to host density. When fluctuating mortality factors are included in a Nicholson parasite-host system the reaction of the parasite causes oscillations with increasing amplitude. This leads to a peak, followed by a crash to a very low density. However, under field conditions, there are many host-parasite systems not characterised by this phenomenon.

In the literature, several mechanisms damping the increasing amplitude inherent to a Nicholson system have been mentioned on theoretical grounds. The most interesting is that given by L. Tinbergen. He measured per cent. predation caused by titmice in caterpillar populations at various densities over a number of successive years. In the range from low to intermediate densities of the prey, mortality proved to be density dependent. When this empirically determined effect is combined with an arithmetical Nicholson host-parasite system, it results in damped oscillations. Hence, in theory, a combination of bird and parasite predators on a common host provides a very good example of a self-regulating system.

SHAW (F. R.). **The effects of field applications of some of the newer pesticides on honey bees.**—*J. econ. Ent.* **52** no. 4 pp. 549–550, 3 refs. Menasha, Wis., 1959.

In tests in Massachusetts, in which honey bees caged on the boughs of fruit trees were sprayed with contact insecticides, transferred to clean cages containing sugar solution as food and kept in the dark, counts after six hours showed that 1–2 lb. 50 per cent. wettable Sevin per 100 U.S. gal., applied with an air-blast machine or hydraulic sprayer, and 0·36 lb. actual Sevin per 100 U.S. gal. in an emulsion spray applied by air blast caused more than 50 per cent. mortality. When the bees were caged for 30 minutes on foliage that had been sprayed 0·5 or 24 hours earlier with 1 lb. wettable Sevin per 100 U.S. gal. and allowed to dry, 100 and 88·5 per cent., respectively, were dead in six hours, after application by air-blast machine, but only 50 per cent. in 96 and 300 hours, respectively, after application by hydraulic sprayer; the residues showed little toxicity after 96 hours. In a similar test, the residue from a spray of 0·25 lb. dieldrin per 100 U.S. gal., applied by air-blast machine, appeared to remain

toxic for at least 96 hours, at the end of which it gave 50 per cent. mortality in 36 hours.

CAROLIN (V. M.) & COULTER (W. K.). **The occurrence of insect parasites of *Choristoneura fumiferana* (Clem.), in Oregon.**—*J. econ. Ent.* **52** no. 4 pp. 550–555, 8 refs. Menasha, Wis., 1959.

The abundance, distribution and importance of parasites of *Choristoneura fumiferana* (Clem.) on Douglas fir [*Pseudotsuga menziesii*] and true fir [*Abies*] in Oregon were determined by making collections at arbitrarily selected places to find what species were present at a particular time and their abundance, and by studying the effectiveness of the parasites in specific infestations each year, for correlation with the population trend of the host. The records were analysed by methods used in plant sociology. The 34 species of primary parasites found were grouped according to the stage of the host attacked, and the percentage control contributed by each species within each group was taken as a measure of density (or abundance). To study the distribution of the 15 species thus shown to be of major importance, the concepts of frequency, defined as the percentage of the total number of sample plots in which a given species is found, and presence, or percentage of the total number of stands in which a given species is found, were used. Comparison of the results for 1948–52 and 1953–56 showed that seven species increased in density without decreasing in presence and that three increased in presence without decreasing in density. For one infestation that was studied in detail, the frequency of parasite species was found to be in direct proportion to their density. Although most of the parasites are believed to be distributed throughout the region, it is obvious that conditions within a single infestation may be unfavourable to the multiplication of some of them. Secondary parasitism is suggested as a factor retarding the increase in density of primary parasites during the early stages of an outbreak.

The most important of the parasites were *Apanteles fumiferanae* Vier., *Glypta fumiferanae* (Vier.) and *Angitia* (*Horogenes*) sp., which attacked the hibernating larvae, and five Tachinids that attacked overwintered larvae in the sixth instar.

GAINES (R. C.), NEWSOM (L. D.), ROUSSEL (J. S.) & EARLE (N. W.). **Rearing and treating successive generations of boll weevils.**—*J. econ. Ent.* **52** no. 4 pp. 555–557, 1 ref. Menasha, Wis., 1959.

In view of the development of resistance to chlorinated hydrocarbons by *Anthonomus grandis* Boh., observed in Louisiana in 1955 [*R.A.E.*, A **46** 344], attempts were made to determine in how many generations resistance to a chlorinated hydrocarbon is acquired or lost, whether resistance develops when the weevils are exposed simultaneously to insecticides of different groups and whether weevils that are already resistant or susceptible to chlorinated hydrocarbons develop resistance to organic phosphorus compounds.

Groups of resistant and susceptible weevils were reared on cotton through ten generations between September 1956 and September 1958 and, in 4–6 generations, were treated topically with endrin, Guthion or a mixture of equal quantities of each. Tests with endrin indicated no reversion to susceptibility in untreated resistant weevils, and treatment with endrin increased the LD50 and LD90 of both resistant and susceptible strains and caused some change in the slope of the dosage-mortality curve. Guthion,

alone or with endrin, caused no changes, but it cannot be concluded that resistance would not develop with continued selection in large populations.

Phillips (G. L.). **Control of insects with pyrethrum sprays in wheat stored in ships' holds.**—*J. econ. Ent.* **52** no. 4 pp. 557–559, 1 fig., 1 ref. Menasha, Wis., 1959.

The control of insects in wheat stored in the holds of ships in the James River, Virginia, and the Hudson River, New York [*cf. R.A.E.*, A **45** 161] has proved difficult; *Plodia interpunctella* (Hb.) is the most important pest, followed by *Sitophilus granarius* (L.), *S. oryzae* (L.), *Tribolium* spp., *Oryzaephilus surinamensis* (L.) and occasionally Psocids. Fumigation was the principal measure used [*cf. loc. cit.*], but a pyrethrum spray applied to the grain surface and elsewhere as a supplement to it in 1956 gave such good control that fumigation was discontinued in 1957 and replaced by an emulsion spray containing 0·3 per cent. pyrethrins and 3 per cent. piperonyl butoxide. This was applied at 2 U.S. quarts per 1,000 sq. ft. to the surface of the grain and the exposed ship surfaces in the storage holds 5–7 times between 1st April and 30th September in Virginia and four times between 15th May and 15th August in New York. A supplementary emulsion spray of 3 per cent. methoxy-DDT (methoxychlor), to give a toxic deposit, was applied once at 1·5 U.S. gal. per 1,000 sq. ft. to the other sections of the ships and to empty ships during May in Virginia and between 16th June and 15th July in New York. Insect counts made between April and November showed that the treatments gave extremely good control throughout the season in New York, but only for as long as the applications were continued in Virginia, where populations of both moths and beetles began to increase in August in ships in which spraying ceased in July. Owing to the high degree of control given by the pyrethrum sprays, there was no larval migration into the empty holds, but it was noted that alighting adults of *P. interpunctella* were killed about as rapidly on methoxy-DDT residues as on pyrethrins. *Sitotroga cerealella* (Ol.), *Tribolium*, *Sitophilus* and *Rhizopertha dominica* (F.) were killed by methoxy-DDT in the empty ships.

Sullivan (W. N.) & Westlake (G. E.). **The effects of multiple gravity on the life cycle of an insect.**—*J. econ. Ent.* **52** no. 4 pp. 559–561, 1 fig. Menasha, Wis., 1959.

Since insects may prove useful and convenient biological indicators in studies concerned with outer space, *Drosophila melanogaster* Mg. was reared for 35 days in a centrifuge, in which it was subjected to a continuous force of ten times the earth's gravity; this approximates to the launching acceleration of a space vehicle. The insects passed through two generations at developmental rates only slightly lower than those at normal gravity, but the percentage of eggs giving rise to adults was reduced from 95·3 to 41·2.

Ebel (B. H.). **Laboratory rearing of a pine cone insect, *Dioryctria abietella* (D. & S.).**—*J. econ. Ent.* **52** no. 4 pp. 561–564, 3 figs., 1 ref. Menasha, Wis., 1959.

Second-year cones of slash pine [*Pinus elliottii*] that had been damaged by insects, mainly larvae of *Dioryctria abietivorella* (Grote) (*abietella*, auct.)

and *D. amatella* (Hulst), were numerous in Florida in the summer of 1957, and a technique was developed by which colonies of *D. abietivorella* were established and maintained in the laboratory. The same technique sufficed to rear *D. amatella* from egg to adult, but further work is needed to maintain this species in continuous culture.

Newly-emerged moths of *D. abietivorella* from field-collected cones were provided with sugar solution and, after two days in breeding cages, the females were removed to jars containing strips of cheesecloth, on which they deposited eggs. Fertile eggs changed from yellow to orange within a day, and were then put on moist filter paper in covered petri dishes, where they hatched 3–7 days after being laid. The larvae were provided with first-year cones of *P. elliottii* or longleaf pine [*P. palustris*], either whole or halved longitudinally; these were dipped in melted paraffin wax to delay desiccation and had the stem ends cut off to provide a point of entry. The filter papers were kept moist enough to prevent the cones from drying, and a fresh cone was provided when a larva had almost consumed the first. The larvae became full-fed in about 17 days and pupated in thin frass-covered cocoons under the cones or on the filter paper. The adults emerged about 11 days later and were removed each day to breeding cages. The life-cycle lasted little more than a month in summer, but much longer in cool weather, and there was 50 per cent. or more survival to the adult stage in May–July.

Difficulties encountered in the course of rearing are discussed. Maximum air temperatures of 88–100°F. in July 1958 reduced adult survival and reproduction and may also have had an effect on the larvae and pupae. Rearing was successful when maximum temperatures did not exceed 85°F., and winter night temperatures as low as 20°F. did not harm the adults, but seemed to affect the eggs.

Moore (D. H.). **Field evaluation of Thiodan as an insecticide for potatoes.** —*J. econ. Ent.* **52** no. 4 pp. 564–567, 10 refs. Menasha, Wis., 1959.

In New York in 1956–58, Thiodan, applied to the foliage in 100–125 U.S. gal. spray per acre, was tested for the control of various injurious insects on potato. On early potatoes, a single application of 0·5 lb. Thiodan per 100 U.S. gal. in a wettable powder or emulsion concentrate on 26th July 1956 caused a great reduction in nymphs of *Empoasca fabae* (Harris) in 48 hours and was as effective as 0·3 lb. wettable parathion against *Leptinotarsa decemlineata* (Say) and more so against *E. fabae* after a fortnight. When applied at intervals of 7–10 days in 1957, 0·25–0·5 lb. wettable Thiodan and 0·5 lb. emulsifiable Thiodan per 100 U.S. gal. were more effective than 0·18 lb. dieldrin or 0·25 lb. parathion in emulsion sprays against *E. fabae*, *Epitrix cucumeris* (Harris) and *Macrosiphum euphorbiae* (Thos.) (*solanifolii* (Ashm.)), though the differences were not all significant; at 0·5 lb., Thiodan increased the yield more than did parathion. Sprays of 2 lb. 25 per cent. wettable Thiodan per 100 U.S. gal., alone or with copper oxychloride sulphate, nabam or bordeaux mixture as fungicides, gave good control of *L. decemlineata*, *E. cucumeris*, *Empoasca fabae* and aphids on late potatoes, and increased the proportion of foliage alive in September–October and the yield. Plants treated with Thiodan and fungicide showed more living foliage and fewer tubers with blight than others, showing that Thiodan did not inhibit the action of the fungicides. In 1958, seven applications in June–July of 0·5 lb. wettable or emulsifiable Thiodan per 100 U.S. gal. were as effective as 0·25 lb. parathion and more effective than 0·8 lb. DDT or 0·187 lb. dieldrin in emulsion sprays against *M.*

euphorbiae and *Myzus persicae* (Sulz.), as effective against *E. fabae* and more so against *Epitrix*. All Thiodan treatments increased the yield.

Chiang (H. C.) & Holdaway (F. G.). **Effect of *Pyrausta nubilalis* (Hbn.) on the growth of leaves and internodes of field corn.**—*J. econ. Ent.* **52** no. 4 pp. 567–572, 16 graphs, 6 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. Investigations in Minnesota in 1954–57 showed that infestation by *Ostrinia* (*Pyrausta*) *nubilalis* (Hb.) inhibits the elongation of maize plants and results in smaller leaves, shorter internodes and a delay in both tasselling and silking. The reduction in leaf size becomes progressively more marked towards the tip of the plant, and the reduction in the length of the internodes is greatest in those near the ear and tassel. The decrease in internode length began when only the leaf blades were injured and without the physical destruction or obstruction of the vascular bundles in the stalk. These results indicate a need for investigations on the feeding activities of the young larvae and plant reaction to such feeding, on whether a phytotoxic secretion may be involved and on the possibility of interrelationship between micro-organisms and infestation by *O. nubilalis*.

Muma (M. H.). **Natural control of Florida red scale on *Citrus* in Florida by predators and parasites.**—*J. econ. Ent.* **52** no. 4 pp. 577–586, 5 figs., 20 refs. Menasha, Wis., 1959.

Chrysomphalus ficus Ashm. (*aonidum*, auct.) is an important pest of *Citrus* in Florida, but infestations causing severe defoliation and fruit drop are nearly always confined to groves in which insecticides or acaricides are used. The importance of parasites and predators in the control of the Coccid was therefore investigated in 1955–58.

The parasitic fungi, *Myiophagus* sp. and *Hirsutella* sp., attack the scale but afford little control, owing to their erratic occurrence and strong dependence on host density. Of the 21 species of predacious arthropods known to feed on *C. ficus*, only six are widely distributed and commonly associated with it, and populations of individual species were not apparently related to decreases in scale populations. It seems likely, therefore, that predators have at most only a levelling effect on infestation.

Of 11 species of parasitic Hymenoptera reared from *C. ficus*, five were primary parasites, three secondary parasites and three of unknown habits. *Prospaltella aurantii* (How.), *Aspidiotiphagus lounsburyi* (Berl. & Paoli) and *Aphytis chrysomphali* (Merc.), which parasitise the males and second-stage females, *Pseudhomalopoda prima* Gir., which attacks the mature females, and the hyperparasite, *Thysanus flavopalliatus* (Ashm.), which attacks *Prospaltella*, were common [*cf. R.A.E.*, A **44** 238]. Parasitism caused high scale mortality, and *Pseudhomalopoda prima* was the critical species. An outbreak of the scale invariably followed any reduction in this Encyrtid, and such reductions were shown to be produced by exposure to direct sunlight, rain, low temperatures and insecticides, particularly the last two [*cf.* **38** 220]. In two tests in 1955, sprays of Aramite (2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite) or sulphur had a prolonged effect in reducing parasitism by this species, but affected *Aspidiotiphagus lounsburyi* or *Prospaltella aurantii*, which were next in importance, less strikingly.

Allen (H. W.). **The Japanese weevil *Pseudocneorhinus bifasciatus* Roelofs.**—*J. econ. Ent.* **52** no. 4 pp. 586–587, 1 ref. Menasha, Wis., 1959.

Observations on the bionomics of *Pseudocneorhinus bifasciatus* Roel. attacking ornamental plants in New Jersey in 1956 and 1957 showed that the adults feed on the foliage and the larvae develop in the soil, apparently feeding on the roots of the plants. Adults were numerous on the foliage in September, but had entered hibernation by mid-October. Oviposition was heavy in September and early October, and some of the eggs hatched before winter and others in early spring. Adults and eggs survived the winter in débris on the ground, and the young larvae in the soil beneath the shrubs. The overwintered adults resumed feeding on the first hot day of spring and continued to feed and deposit eggs throughout the summer; the larvae hatching from these eggs were at most only half grown by the end of August. Larvae that developed from eggs laid in autumn pupated from early June onwards, and adult emergence reached a peak in the first half of July. Larvae, prepupae and pupae were found only in the soil under infested plants, and occurred at depths of 1–9 in. As many as 150 larvae per sq. ft. and 51 adults per yard of privet hedge were found. Chlordane at 10 lb. per acre, applied to the soil under infested plants in a coarse spray in October and washed in with water from a hose, gave no control.

Haynes (D. L.). **Dorsal contact toxicity of six insecticides to wintering larvae of the European pine shoot moth.**—*J. econ. Ent.* **52** no. 4 pp. 588–590, 4 refs. Menasha, Wis., 1959.

In tests in which organic insecticides were dissolved in xylene, added to kerosene to give the desired dosage and applied as sprays in a settling chamber to the backs of overwintering larvae of *Rhyacionia buoliana* (Schiff.) removed from red pine [*Pinus resinosa*] in Michigan, DDT, chlordane and BHC (47·5 per cent. γ isomer) caused no significant mortality at concentrations of 32–128 g. per U.S. gal., whereas malathion, phorate (Thimet) and dimethoate caused 40–45 and 58–83 per cent. mortality in 24 and 96 hours, respectively, at 32 g. per U.S. gal. and 50–70 and 93–98 per cent. in 24 and 96 hours, respectively, at 64 g. per U.S. gal. The failure of DDT suggests that the excellent control obtained with it in the field [*cf. R.A.E.*, A **47** 94] is due to its action as a stomach poison.

Koehler (C. S.), Poinar jr. (G. O.) & Gyrisco (G. G.). **Control of *Hypera postica* (Gyll.) on second-cutting alfalfa in New York.**—*J. econ. Ent.* **52** no. 4 pp. 590–592, 2 refs. Menasha, Wis., 1959.

In 1958, when high temperatures in early spring caused unusually early growth of lucerne in southern New York, most larvae of *Hypera variabilis* (Hbst.) (*postica* (Gyll.)) were removed with the first cutting before doing much harm, but eggs remaining in the stubble gave rise to injurious populations in the second crop. Experiments in three counties are described, in which sprays were applied to the plants at low volume and low pressure on 13th–19th June when they were 2–12 in. high. Heptachlor at 4–8 oz. per acre gave good control for 7–32 days after application, whereas 8 oz. malathion, 4 oz. endrin and 16–32 oz. methoxy-DDT (methoxychlor) were less effective after 17 days and 4 oz. malathion was useless. Guthion at 4–8 oz. and parathion or Phosdrin at 8 oz. were as effective as 8 oz.

heptachlor after five days, but ineffective against both larvae and adults after 16 days, when heptachlor still gave almost complete control of both, and 16 oz. methoxy-DDT or diazinon, 32 oz. chlordane and 4 oz. lindane [almost pure γ BHC] were apparently more effective than 8 oz. heptachlor after five days, though the differences were not significant, and chlordane, γ BHC and heptachlor were very effective after 14 days, but methoxy-DDT and diazinon much less so. At 6·4 oz., γ BHC gave excellent control after seven days, but was rather less effective after 17, and 8 oz. Trithion, 16 oz. ethion and 8 oz. diazinon gave fair and 16 oz. Dibrom [dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate] poor control after seven days; all were ineffective after 17 days. In a single test against the adults on 19th July, when the plants were 12–15 in. high, 8 oz. heptachlor gave good control after six days and rather less after 13, and 4–8 oz. Thiodan and 8 oz. trichlorphon (Dylox) were ineffective. Trithion, trichlorphon and Thiodan were used as flowable and soluble powders and a miscible preparation, respectively, and the other materials as emulsion concentrates.

Fye (R. E.), Hopkins (A. R.) & McMillian (W. W.). **Comparative spray coverage of cotton plants with a conventional and a high-clearance sprayer.**—*J. econ. Ent.* **52** no. 4 pp. 592–596, 4 figs., 4 refs. Menasha, Wis., 1959.

Most of the insecticides recommended against *Anthonomus grandis* Boh. on cotton have little persistent action and should therefore be so placed on the plant that they reach the insect as soon as possible. Tests in which endrin was applied in 5 U.S. gal. emulsion spray per acre with a conventional and a high-clearance sprayer in South Carolina in 1957 are described. The results showed that neither machine could be considered superior to the other. Both placed the heaviest deposit of spray on parts of the plants on which there were most weevils. The conventional sprayer gave better coverage of the interior of the plants and of the lower surfaces of plant parts, but damaged tall plants because of its low clearance, which offset its superiority in spray placement.

Flanders (S. E.). **Biological control of** *Saissetia nigra* **(Nietn.) in California.**—*J. econ. Ent.* **52** no. 4 pp. 596–600, 16 refs. Menasha, Wis., 1959.

The following is based on the author's abstract. *Saissetia nigra* (Nietn.), a tropical insect, adapted itself to subtropical conditions in California and increased to very destructive numbers on various ornamental plants and native vegetation between 1930 and 1939. An introduced endoparasite, *Aphycus* (*Metaphycus*) *helvolus* Comp., was released against the Coccid in 1938 and caused a drastic reduction in its numbers, with the result that it became of no economic importance after a few years [*cf. R.A.E.*, A **33** 374]. The continuing attack by *A. helvolus*, which reproduces in other Coccids and so maintains its numbers, is tending to eradicate *S. nigra*.

Connola (D. P.), Waters (W. E.) & Nason (E. R.). **A sequential sampling plan for red-pine sawfly** *Neodiprion nanulus* **Schedl.**—*J. econ. Ent.* **52** no. 4 pp. 600–602, 4 refs. Menasha, Wis., 1959.

An outbreak of *Neodiprion nanulus* (Schedl) has caused considerable damage to red pine (*Pinus resinosa*) in northern New York since it was

first observed in 1952. The eggs of this sawfly are laid singly in a line along the needle in September and October and hatch in the following May. The larvae feed gregariously on mature needles, become fully grown in June and pupate in cocoons in the débris at the base of the tree. A few pupae may overwinter, but most give rise to adults in the same autumn. Spraying by aeroplane with 12 per cent. DDT in fuel oil at 1 U.S. gal. per acre gave satisfactory control of the larvae, but the area requiring treatment could not be determined until feeding was observed, and the consequent delay resulted in inadequate control programmes.

A study of methods of predicting damage from the overwintering egg populations resulted in the development of a sequential sampling plan [*cf. R.A.E.*, A **44** 159]. This involved cutting a six-inch twig from each of five adjoining trees in turn, and repeating the process on the same trees until the accumulated number of infested needles fell into the categories expected to produce no more than light defoliation or moderate–heavy defoliation; the numbers concerned are shown in a table. Twig samples should be taken from points distributed evenly over the crown, and sampling sites should be distributed evenly over the area and be representative of it.

Applying the plan to field-collected data showed that 45 per cent. of the sampling time would have been saved if the plan had been available for use when the field counts were made, and that it failed only once in 25 tests to predict the degree of defoliation accurately; the confidence levels were set at 90 per cent.

Brazzel (J. R.) & Newsom (L. D.). **Diapause in *Anthonomus grandis* Boh.** —*J. econ. Ent.* **52** no. 4 pp. 603–611, 5 figs., 20 refs. Menasha, Wis., 1959.

The following is substantially the authors' abstract. In Louisiana, some of the adults of *Anthonomus grandis* Boh. on cotton enter diapause in late summer and early autumn and pass the winter in that condition. The diapause is characterised by cessation of gametogenesis and atrophy of gonads, increase in fat content, decrease in water content and decrease in respiratory rate. Weevils in diapause were found in débris on the ground in each month of the year except June and July, when they were almost certainly present but no collections were made. Diapause occurred as early as 30th July and movement to winter quarters began before 16th August in 1957. Fat and water content remained relatively stable in diapausing weevils during the late autumn, winter and early spring, but there was a sharp decrease in fat and a corresponding increase in water content soon after they moved back to cotton in the spring. Spermatogenesis was resumed before the males left their winter quarters, but oogenesis did not begin until the females had fed on seedling cotton.

Floyd (E. H.), Oliver (A. D.) & Powell (J. D.). **Damage to corn in Louisiana caused by stored-grain insects.**—*J. econ. Ent.* **52** no. 4 pp. 612–615, 3 refs. Menasha, Wis., 1959.

The following is substantially the authors' abstract. Investigations in Louisiana in 1955–58 showed that infestation of standing maize by *Sitophilus oryzae* (L.) was extremely high. The percentage of kernels damaged by

insects throughout the State averaged about 10 at harvest and increased during storage to 17 in May and to more than 30 in July. *S. oryzae* was the principal species concerned. *Sitotroga cerealella* (Ol.) caused less than 2 per cent. of the total damage at harvest, but 16 per cent. of that after storage until midsummer; damage by other species was negligible. These included *Cathartus quadricollis* (Guér.), which was present in nearly all ears, and *Tribolium castaneum* (Hbst.), *Oryzaephilus surinamensis* (L.) and *Cryptolestes pusillus* (Schönh.) (*Laemophloeus minutus* (Ol.)), which were less abundant. Damage varied from year to year as well as in different areas. A tight or sound husk covering was found to provide a considerable degree of protection from attack by *Sitophilus* and *Sitotroga* [*cf. R.A.E.*, A **47** 58].

Burke (H. R.). **Toxicity of several insecticides to two species of beneficial insects on cotton.**—*J. econ. Ent.* **52** no. 4 pp. 616–618, 5 refs. Menasha, Wis., 1959.

In laboratory tests in Texas to determine the relative toxicity of widely used insecticides to *Hippodamia convergens* (Guér.) and *Orius insidiosus* (Say), which are important predators of cotton pests [*cf. R.A.E.*, A **32** 122, 125; **39** 124], 3–6 dosages of each insecticide were applied and the LD50's were determined from the dosage-mortality curves. Aphids or mites were supplied as food. When adults of *H. convergens* were confined for four hours on cotton leaves bearing deposits from emulsion sprays and transferred to clean petri dishes for five days, comparison of the LD50's showed that dieldrin was the least toxic material, followed in order by endrin, BHC, mixtures of DDT with toxaphene (1:2), dieldrin (2:1), or heptachlor (2:1), heptachlor, DDT, parathion and methyl-parathion; when the beetles were treated topically with acetone solutions of the technical compounds, dieldrin was followed in order of increasing toxicity by toxaphene, DDT and endrin [*cf.* **41** 142]. When adults of *O. insidiosus* were caged for two days on cotton terminals treated with emulsion spray, toxaphene was the least toxic material, followed by DDT, dieldrin, heptachlor, aldrin, malathion, methyl-parathion and parathion, and toxaphene with DDT (2:1) was less toxic than malathion, dieldrin or heptachlor with DDT (1:2) or BHC with DDT (0·9:1·5).

Wilson (L. F.). **Branch "tip" sampling for determining abundance of spruce budworm egg masses.**—*J. econ. Ent.* **52** no. 4 pp. 618–621, 2 figs., 3 refs. Menasha, Wis., 1959.

Counting the egg-masses of *Choristoneura fumiferana* (Clem.) on branches of balsam fir [*Abies balsamea*] or spruce is a tedious operation, and, although it has been contended that no system of partial sampling is feasible [*cf. R.A.E.*, A **45** 178], a technique was developed in northern Minnesota that modified earlier methods by reducing the size of the sample without greatly decreasing its accuracy. It consists essentially of separating the tips of the shoots from the rest of the branch, and counting the egg-masses on these only. Tests showed that most egg-masses on the apical and lateral twigs were within four and three inches, respectively, of the end of the shoot and that the numbers on the tips must be increased by only 16 per cent. to obtain the total number on the branch. The rest of the foliage, which comprises about 25–40 per cent. of that examined by previous methods, is discarded. The technique can be applied to branches of any size and

from any level of the crown, but not to those severely or completely defoliated.

Wilson (L. F.) & Bean (J. L.). **A modified olfactometer.**—*J. econ. Ent.* **52** no. 4 pp. 621–624, 5 figs., 7 refs. Menasha, Wis., 1959.

The olfactometer described is a further modification of one previously used [*cf. R.A.E.*, B **37** 152; A **40** 35]. Plastic tubing and lucite panels were incorporated wherever possible, and the insect test cage (two cylinders connected by a small doorway) was made equal in size and shape to the two inflow ports, thus eliminating dead air spaces and the intermixing of the airflow between the alternative compartments.

Coon (B. F.). **Aphid populations on oats grown in various nutrient solutions.**—*J. econ. Ent.* **52** no. 4 pp. 624–626, 1 fig., 5 refs. Menasha, Wis., 1959.

In greenhouse tests, oats were grown in nutrient solutions containing nitrogen, potassium or phosphorus, any two of these or all three, and *Rhopalosiphum fitchii* (Sand.) was allowed to infest the plants after they were nine days old and to reproduce on them for 14 days. The results showed that although aphid populations increased gradually during the first four days and then more rapidly, the differences between treatments were not significant for the first seven days, after which the increase was greatest on the plants receiving nitrogen. About seven days are required for the aphid to complete its life-cycle, and after 14 days, when the populations were reflecting the influence of the food-plant, all treatments containing nitrogen resulted in higher populations than nitrogen-deficient media, with one exception, and it is concluded that nitrogen is the major controlling element. Elimination of nitrogen adversely affected the plants. Aphid populations were significantly correlated with plant height after all treatments, and it was not determined whether population differences were due primarily to the nutrient media or to leaf area, which depends on plant height.

Bobb (M. L.). **The biology of the lesser peach tree borer in Virginia.**—*J. econ. Ent.* **52** no. 4 pp. 634–636, 1 fig., 7 refs. Menasha, Wis., 1959.

Aegeria (*Synanthedon*) *pictipes* G. & R. is becoming more numerous on peach throughout Virginia and has caused serious injury in many orchards in the east of the State in recent years. Observations in 1956–58 showed that the female prefers to oviposit in broken bark. The larvae hatch in 8–20 days, depending on the time of year, and large numbers die without becoming established in the trees, survival being highest when they have ready access to active wounds; there was no evidence that larvae initiate injury to young trees. The full-fed larva constructs a cocoon just below the bark or in the frass round the mouth of the larval tunnel, and the prepupal and pupal stages last 3–7 and 15–28 days, respectively. There are two generations a year, and the winter is passed by the larvae in various instars from the second to the sixth under the bark and in old feeding galleries, pupation occurring in spring. The adults of this and the summer generation emerge between early April and late July and between early July and the end of November, respectively, and the larval stages last about 240 and 50 days and the life-cycles nine and three months, respectively.

Summers (F. M.), Donaldson (D.) & Togashi (S.). **Control of peach twig borer on almonds and peaches in California.**—*J. econ. Ent.* **52** no. 4 pp. 637–639, 3 refs. Menasha, Wis., 1959.

Damage by *Anarsia lineatella* Zell. in peach orchards in the central valleys of California has increased so much since 1954 that methods that formerly gave successful control are no longer adequate in several areas. New or experimental chemicals were therefore compared with DDT, parathion and lead arsenate for the control of the borer in 1957–58. Preliminary tests, in which small non-bearing peach and almond trees were sprayed in March or May and the number of twig terminals damaged by surviving larvae of the overwintering or first generation, respectively, counted, were followed by tests of the effect of the more promising compounds in reducing fruit damage on mature peach trees.

When used at 2 lb. per 100 U.S. gal., 50 per cent. wettable Sevin and 25 per cent. wettable Thiodan resulted in consistently lower infestations in twigs and fruits than did 50 per cent. wettable DDT, though the differences were not always significant. On the young trees, Guthion, diazinon, dieldrin, endrin and malathion all showed promise in at least one test, whereas several other materials appeared less effective. When applied to peach against the overwintered larvae on 3rd or 26th March, at the pink-bud or petal-fall stage, and also when the spring generation was hatching, on 20th May, Thiodan, Sevin, lead arsenate, DDT and parathion all reduced crop infestation to fairly low levels, but not enough to give satisfactory commercial control under conditions of severe infestation.

Whitlaw (J. T.), Phillips (W. G.) & Ditman (L. P.). **Observations on commercial application of insecticides for control of sap beetles on sweet corn.**—*J. econ. Ent.* **52** no. 4 pp. 640–642, 6 refs. Menasha, Wis., 1959.

Sap beetles, mainly *Carpophilus lugubris* Murr., which injure the ears of sweet maize in Maryland and Delaware [*cf. R.A.E.*, A **41** 367], are most numerous in July and early August; it is believed that the severe infestations of recent years are associated with the increasing use of the mechanical picker, which leaves on the ground ears of field maize, on which the beetles reproduce in early spring and late autumn.

In 1958, seven fields were treated with phosphorus insecticides, all as emulsion concentrates added to oil, by aeroplane in July or early August, and counts made before and 1–16 days after treatment showed that 1 U.S. pint 25 per cent. parathion or 1 U.S. quart 25 per cent. diazinon in 1–2 U.S. gal. oil and 1 U.S. quart 50 per cent. malathion in 2 U.S. gal. oil per acre all reduced populations, malathion resulting in the greatest reduction and lowest rate of reinfestation, although the residues of parathion and diazinon were more persistent. Increasing the quantity of oil resulted in greater reductions, and the percentage of uninfested ears at harvest was reasonably well associated with the initial reduction of infestation.

Treatments should be applied when the adult population is high and before invasion of the ears has taken place, which occurred when about 50 per cent. of the plants were in silk.

Burkhardt (C. C.). **Effects of heavy fall infestations of spotted alfalfa aphids on subsequent spring growth of alfalfa in Kansas.**—*J. econ. Ent.* **52** no. 4 pp. 642–643, 2 refs. Menasha, Wis., 1959.

Therioaphis maculata (Buckt.) caused severe damage to lucerne in Kansas in 1955–56. It was not known whether the toxic materials injected by the

aphids in autumn or other damage would increase winter mortality of lucerne plants or affect the growth or quality of the hay in the next spring, and the value of killing the aphids when they are present in large numbers on an established stand in autumn, after the last cutting, was tested in 1956–57. Counts at intervals until killing frosts occurred on 14th November showed that treatment of heavily infested lucerne with 1 lb. malathion or 0·375 lb. γ BHC in 17 U.S. gal. emulsion spray per acre on 26th October gave fair and excellent control, respectively. Analysis of lucerne pellets from the first cutting, in May 1957, showed 2 per cent. more protein and 3 mg. per 100 g. more carotene in those from the treated plot, but no increase in yield, and it is concluded that the treatment is not warranted unless lucerne of particularly high quality is desired.

Gifford (J. R.), Burkhardt (C. C.) & Somsen (H. W.). **Effects of Thimet and various stickers on germination and seedling growth of wheat.**—*J. econ. Ent.* **52** no. 4 pp. 650–654. Menasha, Wis., 1959.

Investigations on the effect of seed treatment with phorate (Thimet) in water or in the oils of soy bean, groundnut, maize and rice, and of these alone, on the germination, emergence and seedling survival of three varieties of wheat were carried out at Manhattan, Kansas, in 1957. Treatment with 1 lb. actual phorate per 100 lb. seed with 1 per cent. water had no adverse effect on germination or emergence, but 0·75–1 lb. phorate with water appeared to reduce seedling survival. Germination was reduced by 0·5–1 lb. phorate with 2 per cent. oil, but the three varieties reacted differently to the oils, whether these were applied alone or with phorate. The addition of tetrachloro-p-benzoquinone as a fungicide at 1 lb. per 100 lb. seed counteracted the effect of oil alone, but not the greater effect of oil with phorate. With one exception, emergence and seedling survival were greatly reduced by treatment with phorate and oil; the addition of the fungicide significantly increased survival, but not enough to be of practical value.

Roth (V. D.). **Alfalfa seed treatments for spotted alfalfa aphid control in southwestern Arizona.**—*J. econ. Ent.* **52** no. 4 pp. 654–658, 9 refs. Menasha, Wis., 1959.

In view of the severe damage that *Therioaphis maculata* (Buckt.) causes to lucerne in Arizona [*cf. R.A.E.*, A **48** 22], a more practical method of control than repeated applications of insecticides to the seedlings was sought. In preliminary tests in 1954 and 1955, seed treatment with systemic insecticides gave promising results, and more extensive tests were made in 1956 and 1957. The seed was either mixed thoroughly with measured amounts of technical insecticide or emulsion concentrate and dried by the addition of small amounts of pyrophyllite, or damped with 5 per cent. methyl cellulose solution and mixed with insecticide dust or an activated-charcoal formulation.

O,O-Diethyl S-2-(ethylthio)ethyl phosphorodithioate gave the best control, followed closely by phorate (Thimet), and both tended to remain effective for longer at 48 than at 16–32 oz. technical compound per 100 lb. seed and to be more effective in this form than on activated charcoal. These compounds showed some phytotoxicity in laboratory tests, but did not affect germination or cause significant reductions in nodulation in field plots. They protected the seedlings for up to ten weeks, depending on the temperature, and storing the treated seed for a month before sowing did not appear to reduce the toxicity of phorate. Soil type had no apparent effect on the control obtained with the first material. Lindane [almost

pure γ BHC] also gave good control, but other insecticides were less effective.

Koehler (C. S.) & Gyrisco (G. G.). **Effect of root size and soil moisture on the number of clover root borers present in red clover roots.**—*J. econ. Ent.* **52** no. 4 pp. 658–660, 6 refs. Menasha, Wis., 1959.

Experiments were carried out in New York to find the effect of root size and the percentage of available soil moisture on the numbers of *Hylastes* (*Hylastinus*) *obscurus* (Marsham) occurring in the roots of red clover (*Trifolium pratense*) in its first harvest year, and the following is based on the authors' abstract of the work. In 1956, numbers increased as soil moisture decreased and as root size increased, and a multiple regression analysis indicated that either factor could account for most of the variation, because they were closely related to each other, root size increasing as soil moisture decreased. In 1957, root size alone was responsible for most of the variation in borer numbers. On the basis of these data and differences in the number of areas sampled, the distance between sampling areas, stand uniformity and ranges of soil moisture in the two years, it is concluded that root size has a more direct influence than soil moisture.

App (B. A.). **Studies on the control of alfalfa weevil larvae in the east.**—*J. econ. Ent.* **52** no. 4 pp. 663–666, 5 refs. Menasha, Wis., 1959.

Of 27 insecticides tested in Maryland in 1953–57, mainly in 10 U.S. gal. emulsion spray per acre, for the control of larvae of *Hypera variabilis* (Hbst.) (*postica* (Gylh.)) on lucerne [*cf. R.A.E.*, A **43** 49], aldrin, dieldrin, endrin, heptachlor and Thiodan were the most effective. Aldrin at 2–4, dieldrin and heptachlor at 1–2 and endrin at 2–8 oz. per acre caused about 95 per cent. or more reduction after 1–2 weeks, but the higher dosages were the more effective after 2–3 weeks and all decreased rapidly in effect after 3–4 weeks. Spraying with 4 oz. heptachlor per acre was more effective in late April than earlier or later, and varying the amount of water to 5 or 20 U.S. gal. per acre had little effect on control.

Heptachlor, endrin and dieldrin in granules alone and heptachlor in granules with fertiliser were less effective than the same insecticides in sprays, even when applied at 1 lb. per acre. Endrin, Phosdrin and Thiodan were somewhat better than the other insecticides tested singly in sprays for the combined control of *H. variabilis*, *Macrosiphum pisum* (Harris) and *Philaenus leucophthalmus* (L.), but mixtures of 4 oz. heptachlor with 10 oz. malathion, 4 oz. demeton, 16 oz. diazinon or 8 oz. dicapthon or of 4 oz. dieldrin or 6 oz. aldrin with 10 oz. malathion per acre were generally more effective.

Howitt (A. J.), Waterhouse (J. S.) & Bullock (R. M.). **The utility of field tests for evaluating insecticides against the garden Symphylid.**—*J. econ. Ent.* **52** no. 4 pp. 666–672, 5 figs., 8 refs. Menasha, Wis., 1959.

Howitt (A. J.). **Laboratory and greenhouse tests for evaluating compounds in the control of the garden Symphylid,** *Scutigerella immaculata* **(Newport).**—*T.c.* pp. 672–677, 3 figs., 4 refs. **Control of** *Scutigerella immaculata* **(Newport) in the Pacific Northwest with soil fumigants.**—*T.c.* pp. 678–683, 1 fig., 7 refs.

The following paragraphs are based largely on the authors' abstracts of these three papers, respectively.

Field plots comprising a total area of 54 acres were established in Washington State in 1955–57 to evaluate compounds applied to the soil in wettable-powder or emulsion-concentrate sprays for the control of *Scutigerella immaculata* (Newp.), which has recently caused increased injury to crops in the Pacific Northwest of the United States, but the irregular distribution, non-feeding phases and preferential feeding habits of the pest complicated the interpretation of the results in all but about 10 per cent. of them. Parathion at 5 lb. per acre consistently gave better results than any other material tested, though it failed on some occasions.

In view of the erratic results obtained in the field, controlled laboratory experiments were carried out in which toxicants were mixed with soil to give a concentration of 2·5 parts per million and tested against *S. immaculata* after various periods. Of the 46 tried, only parathion, UCC 8305 (P-chloro-2,4-dioxa-5-methyl-P-thiono-3-phosphabicyclo(4.4.0)decane), V-C 13 (O,O-diethyl O-2,4-dichlorophenyl phosphorothioate), Am.Cyanamid E.N. 18133 (O,O-diethyl O-2-pyrazinyl phosphorothioate) and lindane [almost pure γ BHC] were initially toxic and had some degree of residual effectiveness. E.N. 18133 gave outstanding results and appeared to be the most promising compound tested; chlorinated hydrocarbons other than BHC had little effect.

In field tests with soil fumigants, ethylene dibromide and 1,2-dibromo-3-chloropropane were ineffective against *S. immaculata* when applied to established crops. Under controlled conditions with caged individuals, methyl bromide was the most effective fumigant tested, and 1,3-dichloropropene was the most effective of the liquids that could be applied with conventional equipment. Dimethyl disulphide was rather less effective, but merits further testing because of its safety to plants, and chloropicrin, sodium methyldithiocarbamate, ethylene dibromide, 1,2-dibromo-3-chloropropane and 1,2-dichloropropane were ineffective. Under field conditions, 10 U.S. gal. 1,3-dichloropropene per acre gave satisfactory control in light soils.

Elmosa (H. M.), King (H. L.) & Guyer (G. E.). **A modified microburet for topical application of insecticides to the onion maggot,** *Hylemya antiqua* **(Meig.).**—*J. econ. Ent.* **52** no. 4 pp. 683–684, 1 fig., 4 refs. Menasha, Wis., 1959.

The authors describe a syringe microburette designed for the topical application of insecticide solutions to insects and give the results of an experiment in which 15 organic insecticides were applied to adults of *Hylemyia antiqua* (Mg.). The toxicants were dissolved in acetone, and at least four concentrations were used to determine the LD50's. Counts made 24 hours after treatment showed that methyl-parathion, dimethoate and diazinon, with LD50's of 1·3, 1·32 and 1·35 μg. per g. of fly body weight, were the most effective.

Strong (R. G.) & Rawlins (W. A.). **Field evaluation of four insecticides for the prevention of lettuce-yellows disease with known populations of viruliferous six-spotted leafhoppers.**—*J. econ. Ent.* **52** no. 4 pp. 686–689, 9 refs. Menasha, Wis., 1959.

Tests were made of the effect of controlling *Macrosteles fascifrons* (Stål) on lettuce in New York with emulsion sprays of DDT, demeton, malathion and parathion [*cf. R.A.E.*, A **48** 128] on the incidence of lettuce yellows, caused by the eastern strain of *Chlorogenus callistephi* var. *vulgaris*. Young

adults reared in the laboratory [*cf.* **46** 96] were allowed to feed on infected China aster [*Callistephus chinensis*] for at least three days and on barley to complete a total of 18 days [*cf.* **47** 429] and were then caged over plots of lettuce at intervals after the plants had been treated 1, 3 or 5 times at intervals of 6–10 days with 8 oz. DDT, 3 oz. demeton, 20 oz. malathion or 4 oz. parathion per acre. The cages were 7 ft. square, 50 insects were used in each and they were allowed to feed for three hours. Counts about 2–4 weeks later showed that spraying generally reduced the incidence of disease, though infection among the control plants was low. Differences between treatments were not readily apparent, but malathion was the most and DDT the least effective when the insects were caged after two hours and only malathion showed any effect after ten days [*cf.* **48** 128].

When infective insects at rates of 1–20 per 10 plants were caged on untreated plots, the incidence of disease mostly increased with insect numbers, and the highest of these seemed most desirable for use in tests. Applications of 12 oz. DDT, 6 oz. demeton or parathion or 20 oz. malathion to plants infested at this rate reduced the incidence of disease noticeably when made less than one hour before infestation, but less obviously when made three days before, and it is considered that the degree of protection achieved would be unsatisfactory to growers.

Michelbacher (A. E.) & Wasbauer (M.). **Walnut serpentine leaf miner, *Nepticula juglandifoliella* Clem., a pest of English walnut.**—*J. econ. Ent.* **52** no. 4 pp. 690–692, 2 figs., 2 refs. Menasha, Wis., 1959.

Nepticula juglandifoliella Clem. was found attacking walnut in a localised area in the Salinas Valley of California in 1958. On 30th July, adults were numerous and there was evidence that the insect had already passed through two generations. The eggs were deposited on the lower surfaces of the leaflets, usually next to a vein, and the larvae bored directly into the leaf tissue and developed just under the upper epidermis; the mature larvae cut through this and dropped to the ground to pupate. Many leaflets contained 150 or more mines, and most of the larvae in them were parasitised. In some localities there was 90 per cent. parasitism, but 200 of 600 acres of trees were nevertheless seriously damaged at harvest. Three Eulophid parasites, *Zagrammosoma nigrolineatum* Crwf., *Solenotus begini* (Ashm.) and *Closterocerus utahensis californicus* Gir., were reared from infested leaves, the first predominating early and the last late in the season. It is believed that these control the moth under ordinary conditions and that applications of demeton against the walnut aphid [*Chromaphis juglandicola* (Kalt.)] may have interfered with them.

Peay (W. E.). **Laboratory tests for control of the beet leafhopper on snap beans grown for seed.**—*J. econ. Ent.* **52** no. 4 pp. 700–703, 2 figs., 2 refs. Menasha, Wis., 1959.

Further investigations on the control of *Circulifer tenellus* (Baker) and consequent reduction of curly-top disease on snap beans grown for seed in southern Idaho [*cf. R.A.E.*, A **45** 106] were begun in the laboratory in 1953. Of large numbers of materials applied to the foliage in sprays, a mixture of 0·125 per cent. phorate (Thimet) with 4 per cent. juice pressed from sugar beets that were highly resistant to the virus gave outstanding control of both insect and disease, and 1 per cent. dichlorvos (DDVP), 0·6 per cent. of a mixture of lindane [almost pure γ BHC], DDT and Aroclor [a

chlorinated polyphenyl], 1·25 per cent. DDT and 0·125 per cent. dimethoate or phorate alone were effective. The phorate mixture reduced infestation but not the incidence of the disease when applied to the seeds, and seed treatment with antibiotics, hormones or other systemic insecticides was less satisfactory than foliage treatment.

Blinn (R. C.), Dorner (R. W.) & Gunther (F. A.). **Comparative residual behavior of pyrethrins and piperonyl butoxide on wheat.**—*J. econ. Ent.* **52** no. 4 pp. 703–704, 8 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract and discussion. Because of the difficulty of determining residues of pyrethrins quantitatively in the presence of high concentrations of its usual synergist, piperonyl butoxide, those of the latter, which are readily determined, have been used in most residue studies of the mixture. However, comparison of the persistence of the two materials in stored wheat by chromatographic techniques in conjunction with colorimetric procedures showed that pyrethrins and piperonyl butoxide have apparent half-lives of 5·8 and 9·9 weeks, respectively, and it is concluded that the practice is not valid, though it can be accepted for purposes of defining toxicological hazard if the actual relation of the residues of the two materials is considered.

Strong (R. G.) & Lindgren (D. L.). **Effect of methyl bromide and hydrocyanic acid fumigation on the germination of rice.**—*J. econ. Ent.* **52** no. 4 pp. 706–710, 10 refs. Menasha, Wis., 1959.

Samples of two varieties of rice, with moisture contents adjusted to 8, 10, 12 and 14 per cent., were fumigated with various dosages of methyl bromide or hydrogen cyanide at temperatures of 50, 70 or 90°F. in gas-tight chambers 100 cu. ft. in capacity. Half the samples were fumigated once and half twice, and germination tests were made within five days of fumigation and after storage at 50°F. for 84 days [*cf. R.A.E.*, A **48** 378, etc.]. Fumigation with 1–3 lb. HCN per 1,000 cu. ft. for 72 hours caused no damage, but methyl bromide at 1·5–4 lb. for 24 hours, 2–6 lb. for 8 hours or 3–6 lb. for 2 hours killed some of the seeds; there was little evidence of retarded emergence of the seedlings. The two varieties reacted similarly, the amount of damage increasing with increasing moisture content, period of exposure, temperature and dosage. The second fumigation increased any injury caused by the first, but did not initiate damage. No significant difference was observed in the reduction of germination immediately after fumigation and after storage.

Earle (N. W.), Gaines (R. C.) & Roussel (J. S.). **A larval diet for the boll weevil containing an acetone powder of cotton squares.**—*J. econ. Ent.* **52** no. 4 pp. 710–712, 6 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract. A diet for larvae of *Anthonomus grandis* Boh. was developed, using cotton squares, bolls or leaves as the source of protein. A fine powder was prepared by grinding the plant parts with 3–5 volumes of acetone, recovering the solids by filtering and resuspending them twice more with acetone in the blender, and this was mixed with agar, salts, sugar, vitamins, cholesterol, soy-bean protein and water. The most successful diet was that made from the squares,

adults from larvae reared on this being larger than those reared on diets containing soy-bean protein or casein as the only source of protein [*cf.* *R.A.E.*, A **47** 322]. The addition of sorbic acid and methyl p-hydroxybenzoate as mould inhibitors eliminated the need for sterilisation. Successive generations of *A. grandis* can be maintained in the laboratory by allowing adults to feed and oviposit in cotton squares and removing the eggs to the larval diet; the weevils reach maturity in 2–3 weeks at 27°C. [80·6°F.].

Schread (J. C.). **Thimet soil treatments for control of leaf miners, galls, and lace bugs.**—*J. econ. Ent.* **52** no. 4 pp. 712–713, 1 ref. Menasha, Wis., 1959.

Observations in Connecticut in 1958 on the further results of soil treatment in 1957 with granules containing 2 per cent. phorate (Thimet) [*cf.* *R.A.E.*, A **47** 256–257] showed that applications of 10–20 lb. phorate per acre on 4th June gave complete mortality of the first brood of *Fenusa pusilla* (Lep.) on birch [*Betula populifolia*], in the second year, but that only treatment at 40 lb. per acre on 12th April gave substantial control of the second generation. Applications of 4–8 oz. granules per tree on 19th July gave no control of *Phytomyza ilicicola* Lw. (*ilicis*, auct.) on holly [*Ilex opaca*] in the following year, but 12 and 16 oz. gave good and complete control, respectively; the highest dose caused yellowing of the new foliage in spring, but this had disappeared by autumn. Treatment with 0·16–0·32 oz. actual phorate per plant on 18th July 1957 gave complete control of *Monarthropalpus buxi* (Lab.) on box [*Buxus*] on 15th August 1958, whereas 0·08 oz. was ineffective.

Phorate applied to the soil under Moraine locust trees [*Gleditsia*] at 0·31 and 0·62 oz. per tree in an emulsion or at 0·48 and 0·96 oz. in granules on 10th April 1957, reduced the percentage of leaflets galled by the first generation of *Dasyneura gleditchiae* (O.-S.) on 29th May from 79·8 to 27·9, 19·2, 25·8 and 13·8, respectively, but was relatively ineffective against the second and later generations. When applied in 8 per cent. granules, diluted with dry sand, and raked into the top inch of soil under each plant in July 1958, followed by four soakings with water, 0·16 and 0·32 oz. phorate gave 68·4 and 85·1 per cent. control of adults of *Stephanitis globulifera* (Mats.) on andromeda (*Pieris japonica*) on 5th August and reduced the number of living adults and nymphs (which occurred in a ratio of 5:95) of *S. pyrioides* Scott on azalea from 81 to 13 and zero, respectively, on 1st August; 0·08 oz. phorate was as effective as 0·16 oz. against *S. pyrioides*.

Bishop (J. L.) & Burkhardt (C. C.). **Seed treatment with systemic insecticides for control of spotted alfalfa aphids under Kansas conditions.** —*J. econ. Ent.* **52** no. 4 pp. 714–719, 8 refs. Menasha, Wis., 1959.

The following is based on the authors' abstract of this account of experiments on the control of *Therioaphis maculata* (Buckt.) on lucerne in Kansas. Lucerne seed was soaked in demeton at 0·25 per cent. for half an hour or at 0·5 per cent. for half an hour or an hour, or mixed with powders affording 1, 2 or 4 lb. ronnel [O,O-dimethyl O-2,4,5-trichlorophenyl phosphorothioate], phorate (Thimet) or Di-Syston (O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate) per 100 lb. seed, and set to germinate after intervals of up to a year. There was no significant reduction in germination or plant emergence after treatment with phorate or Di-Syston

and slight reduction in emergence after treatment with ronnel. Both germination and emergence were reduced after seed treated with demeton had been stored for six months or more, probably because of inadequate drying of the seed. There was no reduction in aphicidal effectiveness after storage for up to 12 months, and no phytotoxic effects were observed, except for a temporary browning of the leaf margins after treatment with ronnel. Whatever the interval before sowing, Di-Syston generally gave complete control for six weeks at the two higher rates and over 95 per cent. at the lowest. Phorate gave complete control for four weeks and good or moderate control for the next two at the two higher rates, but ronnel and demeton were generally ineffective beyond the second week.

Blinn (R. C.) & others. **Locale of aged Tedion residues on *Citrus* fruits.**—*J. econ. Ent.* **52** no. 4 pp. 723–724, 5 refs. Menasha, Wis., 1959.

The following is substantially the authors' abstract. Most residues of organic compounds on *Citrus* fruit quickly penetrate the waxy cuticle and enter the oily portions of the peel, where they are protected from the various chemical and physical forces of weathering and are generally inaccessible to pests. Thoroughly rinsing the surfaces of field-treated oranges with selective solvents showed that about 90 per cent. of the Tedion residue was within the waxy cuticle, although not uniformly distributed throughout. About 56 per cent. of the residue was extracted with 2–4 per cent. of the wax by rinsing with acetonitrile, and about 60 per cent. of the residue on lemons was removed by commercial washing operations.

Dean (H. A.). **Quadrant distribution of mites on leaves of Texas grapefruit.**—*J. econ. Ent.* **52** no. 4 pp. 725–727, 4 refs. Menasha, Wis., 1959.

The following is substantially the author's abstract. Populations of three species of mites sampled from terminal-flush grapefruit leaves in Texas differed according to the quadrant on the tree from which they were collected. *Eutetranychus banksi* (McG.) was most abundant on the south side throughout the year, except for two months after the peak population, which occurred in May in 1955 and June in 1956, when they predominated on the north. *Phyllocoptruta oleivora* (Ashm.) was more numerous on the east and north sides for eight months of the year, and was most abundant in the north-east quadrant. In a grove dusted with sulphur, the predominance of *E. banksi* on the north side of the trees occurred 1–2 months later than on the untreated trees, and *P. oleivora* was most numerous on the east side. *Brevipalpus* spp. were commoner on the west side.

Klostermeyer (E. C.). **The relationship between insecticide-altered aphid populations and the spread of potato leaf roll.**—*J. econ. Ent.* **52** no. 4 pp. 727–730, 4 refs. Menasha, Wis., 1959.

The following is substantially the author's abstract. The effect of controlling *Myzus persicae* (Sulz.) on potato in central Washington on the spread of the leaf-roll virus disease has varied from a considerable reduction to an increase. In 1955 and 1956, sprays applied when large

populations of aphids were migrating to the potatoes resulted in a larger proportion of net necrosis in the tubers, induced by leaf-roll, than was found in the untreated plots. Futhermore, treatment in 1956 with diazinon, schradan or mixtures of the two reduced the yield and quality of the crop. Diazinon greatly reduced the population of wingless aphids, but rendered the plants toxic to winged migrants for only a short period; two weeks after treatment, the populations in such treated plots were as much as four times those on untreated plots, and the increased net necrosis and decreased yield were associated with the post-treatment increase in populations of winged and wingless aphids [*cf. R.A.E.*, A **45** 184].

In 1957, aphid populations were small, and control resulted in decreased net necrosis. Weekly treatments with schradan and diazinon during the migratory period resulted in only 7 per cent. net necrosis, as compared with 18 per cent. in the untreated plots. Three weekly treatments before 20th July resulted in 14 per cent. net necrosis and three after 30th July in 9 per cent., indicating that the greatest spread of leaf-roll occurred during the latter part of the aphid migratory period. Weekly applications of parathion resulted in 15 per cent. net necrosis, only slightly less than that in untreated plots.

Luckmann (W. H.) & LeSar (C. D.). **Biology and control of** *Centrinaspis capillatus* **(Lec.) in redtop.**—*J. econ. Ent.* **52** no. 4 pp. 730–733, 2 figs., 4 refs. Menasha, Wis., 1959.

Redtop (*Agrostis alba*) is a perennial grass of European origin, but 85 per cent. of the world supply of seed is produced in southern Illinois, where *Centrinaspis capillatus* (Lec.) destroys up to 75 per cent. of the crop. The adults of this weevil overwinter in the soil and are present on the plants from about 5th May to 15th July. They oviposit in the stems within 7–10 days of leaving hibernation, and eggs are present from mid-May to late June. The larvae hatch in 8–10 days, feed for 30–40 days in the internodes and then enter the soil, where they remain relatively inactive for 30–40 days before pupating. The pupal stage lasts 10–14 days, and there is one generation a year. Infested plants produce little or no seed, but treatment with 0·25 lb. dieldrin or 0·5 lb. heptachlor in 15 U.S. gal. spray per acre on 22nd–24th May 1957 and 1st–2nd June 1958 gave satisfactory control and increased the yield; 1 lb. DDT per acre appeared to give the best control of the whole insect complex found on *A. alba*. *C. capillatus* has not been recorded from northern Illinois.

Fukuto (T. R.) & Metcalf (R. L.). **Insecticidal activity of the enantiomorphs of O-ethyl S-2-(ethylthio)ethyl ethylphosphonothiolate.**—*J. econ. Ent.* **52** no. 4 pp. 739–740, 8 refs. Menasha, Wis., 1959.

Tests with the dextro, laevo and racemic forms of O-ethyl S-2-(ethylthio)-ethyl ethylphosphonothioate showed that the laevo isomer was 6, 9·7 and 10 times as toxic by contact as the dextro isomer to adults of *Musca domestica* L., honey bees and mosquito larvae and inactivated fly-brain cholinesterase 11 times as rapidly; the racemic form gave values approximating to the means for the two resolved forms. It is clear that the toxicity of these compounds closely parallels the rates at which they inactivate cholinesterase.

Van Middelem (C. H.) & Waites (R. E.). **Demeton residues on turnips, squash, tomatoes, peppers and snap beans.**—*J. econ. Ent.* **52** no. 4 pp. 741–744, 6 refs. Menasha, Wis., 1959.

When plants in field plots were treated with 1–8 oz. demeton in 100 U.S. gal. emulsion spray per acre, analysis by the inhibition of cholinesterase [*cf. R.A.E.*, A **40** 204] showed that little if any toxicant was translocated into developing turnip roots or into the fruits of squash, tomato or peppers [*Capsicum*], which could apparently be safely harvested seven days after the last of three applications of 4 oz. demeton per acre, made at intervals of 7–10 days. Turnip tops, however, contained such high initial quantities that a period of at least 21 days between the last application and harvest was necessary to prevent excessive residues, and although the residues in snap beans were relatively low, an interval of 14 days after the last application is recommended in view of the low tolerance of 0·3 part per million set for this crop in the United States.

The results of pouring 1 U.S. pint of a water emulsion containing 8 oz. demeton per 100 U.S. gal. round the base of pepper and tomato plants at the time of transplanting indicated that entirely different conditions are involved in soil treatment and that such treatment at any later stage might be unsafe.

Tashiro (H.) & Tuttle (E. L.). **Blacklight as an attractant to European chafer beetles.**—*J. econ. Ent.* **52** no. 4 pp. 744–746, 1 fig., 3 refs. Menasha, Wis., 1959.

The following is based on the authors' summary. Traps fitted with 15-watt fluorescent lamps radiating light in the near-ultraviolet region of 3,200–3,800 Å proved highly attractive to adults of *Amphimallon majalis* (Razoum.) when tested in New York between 21st July and 2nd September 1958. Populations were very small, as the beetles are normally in flight from mid-June to late July, with only a few stragglers later, but the light-traps caught them on nights when none was seen in flight, and up to 70 times as many were taken in them as in the best chemically baited traps [*cf. R.A.E.*, A **43** 241]. They caught more females than males and were effective throughout the night, whereas chemical traps caught more males than females and were attractive only during 30 minutes at sunset. Chemically baited traps need an open situation, but the light-traps were more effective when placed near trees to which beetles flew.

Connell (W. A.). **Estimating the abundance of corn earworm eggs.**—*J. econ. Ent.* **52** no. 4 pp. 747–749, 2 figs., 5 refs. Menasha, Wis., 1959.

Adults of *Heliothis zea* (Boddie) prefer to oviposit on fresh maize silks, and as several thousand acres of field maize are in silk between 15th July and 5th August in Delaware, offering an abundance of favourable oviposition sites, most sweet maize is sown so as to silk at that time. However, the moth population is apparently not evenly distributed, so that severe infestations occur every year in scattered fields. Investigations on methods of detecting such infestations in time to control them showed that ultraviolet-light traps were ineffective, as there were wide variations between the numbers of adults captured and of eggs on the silks. Examination of fresh silks for eggs in the field and under the microscope showed that many were overlooked in the field, and a method was therefore developed of removing

the eggs from the silks for rapid counting under a low-power microscope. Silks were clipped from ears in the field, shaken in petrol in a wide-mouthed flask for three minutes and removed by means of a stirring rod ending in a circle of horizontal wire bristles. The petrol and suspended débris was floated off with 70 per cent. ethanol and the eggs, in the ethanol, were poured into a watch glass for counting.

Oatman (E. R.). **Apple maggot control studies with soil insecticides.**—*J. econ. Ent.* **52** no. 4 pp. 751–752, 1 fig., 4 refs. Menasha, Wis., 1959.

Rhagoletis pomonella (Walsh) is a serious pest of apple in Wisconsin, particularly in small orchards, where control by carefully timed foliage sprays is difficult if there are neglected trees in the neighbourhood. It overwinters as a pupa in the soil, and tests of soil insecticides, sprayed on undisturbed sod at 5·3 lb. per acre, showed that endrin caused 96 per cent. reduction in adult emergence the next summer and was significantly more effective than dieldrin, aldrin and heptachlor, which caused 66, 63 and 60 per cent. reduction, respectively. As endrin is already used against rodents in orchards [*cf. R.A.E.*, A **46** 447, 487], treatment against *R. pomonella* may give useful control of other pests.

Dominick (C. B.). **Feeding of overwintered tobacco flea beetles and first brood emergence following soil treatment with insecticides.**—*J. econ. Ent.* **52** no. 4 pp. 753–754, 4 refs. Menasha, Wis., 1959.

In tests in Virginia in 1956–58, aldrin, chlordane or heptachlor, applied to the soil in granules about three weeks before tobacco was transplanted into it, and immediately disked into the top two inches of soil, caused significant reductions in leaf punctures on the newly set plants by the overwintered adults of *Epitrix hirtipennis* (Melsh.), with no significant differences between compounds or between rates of 3 and 6 lb. aldrin or heptachlor per acre, but were less effective than a foliage spray of 2 lb. 50 per cent. wettable DDT per 100 U.S. gal., applied in the plant bed at 5 U.S. gal. per 100 sq. yards before transplanting; chlordane was applied at 4 lb. only. The soil treatments were very effective in preventing the emergence of adults of the first generation from two soil types, with no significant difference between insecticides. In untreated plots, more beetles emerged from an eroded loam than from a sandy loam soil.

Dorst (H. E.). **Field control of *Drosophila* spp. in cull fruit.**—*J. econ. Ent.* **52** no. 4 p. 755, 3 refs. Menasha, Wis., 1959.

Species of *Drosophila*, chiefly *D. melanogaster* Mg., attacking tomatos for processing in the United States, sometimes originate from piles of waste fruit in neighbouring peach orchards [*cf. R.A.E.*, A **43** 325], but sprays applied to such piles gave poor control in 1949–50, because they affected only the surface. In further tests in Colorado in 1952–53, 2–3 applications of insecticide dust gave satisfactory control, and single applications of granules were equally effective in 1954. Tests of granules, applied at 0·5 lb. per 10-bushel pile, were made in 1954–58. Control was determined from the number of adults that adhered to a fly-paper laid over the centre of the pile after a pyrethrum aerosol had been applied along each side to activate them, and counts made 14 and 28 days after treatment with the granules

showed that, of 17 insecticides used, 2·5 per cent. endrin or diazinon, 5 per cent. lindane [almost pure γ BHC] and 15 per cent. malathion gave at least 95 per cent. reduction in numbers after 28 days and 1 per cent. diazinon, 5 per cent. BHC, dieldrin or heptachlor and 2·5 per cent. γ BHC or aldrin at least 90 per cent.

Walker jr. (J. K.). **Some observations on the development of the boll weevil on the wine cup, *Callirrhoe involucrata* (Nutt.) A. Gray.**—*J. econ. Ent.* **52** no. 4 pp. 755–756, 4 refs. Menasha, Wis., 1959.

In central Texas, overwintered adults of *Anthonomus grandis* Boh. have been observed to feed and oviposit on *Callirhoë involucrata*, a common malvaceous plant [*cf. R.A.E.*, A **2** 582]. In tests in 1957–58, in which eggs were implanted in the buds, hatching and some larval development occurred, but very few adults emerged. Owing to the rapid development of the buds, complete larval growth can be attained only if the egg is deposited in a very young bud. Weevils laid eggs in and on both buds and fruit capsules of this plant.

Parencia jr. (C. R.). **Comparative yields of cotton in treated and untreated plots in insect-control experiments in central Texas, 1939–1958.**—*J. econ. Ent.* **52** no. 4 pp. 757–758. Menasha, Wis., 1959.

The results of field experiments on the control of insects attacking cotton in central Texas in 1939–58 show that *Anthonomus grandis* Boh. and *Heliothis zea* (Boddie) were of primary importance in most years, that *Psallus seriatus* (Reut.) was present in many years and *Aphis gossypii* Glov. of considerable importance until chlorinated hydrocarbons other than DDT became available. Infestations by *Alabama argillacea* (Hb.) and *Tetranychus desertorum* Banks were not usually allowed to develop to proportions that might influence results against the test insects. Experiments against early-season insects were rare until 1949, when low-volume sprays were developed for the application of chlorinated hydrocarbons. Insecticides were applied principally as dusts until 1948 and then as low-volume, low-pressure emulsion sprays. Insect control resulted in substantial increases in yield in most years, averaging 34 per cent. before and 53 per cent. since the introduction of organic insecticides in 1945.

Phillips (W. G.) & Bissell (T. L.). **Field insecticide tests for alfalfa weevil and pea aphid.**—*J. econ. Ent.* **52** no. 4 pp. 758–759. Menasha, Wis., 1959.

In tests on *Hypera variabilis* (Hbst.) (*postica* (Gylh.)) and *Macrosiphum pisum* (Harris) attacking lucerne in Maryland in 1958, sprays of 1 lb. Dibrom (dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate), trichlorphon (Dylox), Guthion, Sevin, dimethoate (Am.Cyanamid 12880) or Am.Cyanamid 18706 (O,O-dimethyl S-ethylcarbamoylmethyl phosphorodithioate) or 0·5 lb. Thiodan in 25 U.S. gal. water per acre were applied on 30th April, when the plants were about 10 in. high. Sampling with an insect net before and after treatment showed that Guthion, dimethoate and 18706 gave at least 96 per cent. control of the aphid and the adult weevils on 9th May

and the first two more than 90 per cent. reduction of weevil larvae; Thiodan equalled them in effectiveness against the aphid, and all four were still effective against this on 16th May, when control of *H. variabilis* was relatively poor. The other materials gave much inferior results. Comparison with a field sprayed on 2nd May with a mixture of 6 oz. heptachlor and 15 oz. malathion in 25 U.S. gal. water per acre, the standard recommendation in Maryland, showed that this was more effective than any of the test materials. All except 18706 caused some chlorosis of the plants, though that from dimethoate was negligible. Those treated with Thiodan showed average residues of 0·09 part per million at harvest on 27th May.

Randolph (N. M.) & Newton (W.). **The effects of certain insecticides on the chinch bug on grain sorghum.**—*J. econ. Ent.* **52** no. 4 pp. 759–760. Menasha, Wis., 1959.

In north-eastern Texas, adults of *Blissus leucopterus* (Say) apparently flew from lightly infested fields of small grains to grain sorghum and maize, reaching destructive numbers on these crops, in late June 1958. Various materials were tested for their control on sorghum, in emulsion sprays applied at 4 U.S. gal. per acre; an application to the tops of the plants on 3rd July was ineffective, except in the case of toxaphene, as it did not reach the feeding insects, and another was made to the lower parts of the plants on 15th July, when they had reached a height of 20–30 in. Counts of nymphs and adults showed that treatment with 3 lb. toxaphene per acre on the two dates and with 0·5 lb. Thiodan or 0·25 lb. dieldrin on the second of them gave 93·6, 96·7 and 89·9 per cent. control on 18th July and 87·3, 82·5 and 87·7 per cent. on 25th July, respectively.

Gerhardt (P. D.) & Wene (G. P.). **Resistance of the mite, *Tetranychus cinnabarinus* (Bois.) to organic phosphate acaricides.**—*J. econ. Ent.* **52** no. 4 pp. 760–761, 3 refs. Menasha, Wis., 1959.

In the autumn of 1957, demeton and parathion failed to control *Tetranychus cinnabarinus* (Boisd.) on cotton in the Litchfield Park area of Arizona, where organic phosphates had been used frequently and extensively for insect control. Near this area, the same mite on roses was controlled by malathion sprays in September and October 1957, and laboratory tests were therefore carried out to compare the relative susceptibility of mites from the two plants. Cotton leaves were sprayed to run-off with acetone solutions of 0·1, 1 or 1·5 per cent. demeton, parathion or amiton oxalate (Chipman R-6199), allowed to dry and then infested with adult mites. Counts made after 20 hours indicated that demeton and parathion caused much lower mortalities of the mites from cotton than of those from rose, and amiton oxalate showed a similar trend. In the spring of 1958, the mites on rose were apparently becoming resistant to malathion and other phosphates, to such a degree that Aramite (2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite) was used for their control.

Beets planted in one of the fields after the cotton was harvested were found to be infested with *T. cinnabarinus* in May 1958; sprays were applied at 35 U.S. gal. per acre, and counts made 6–14 days later showed that 0·375 lb. demeton per acre did not give commercial control; 1 lb. Trithion and 0·6 lb. Kelthane were more effective, but less so than 1 lb. Aramite, and it is concluded that the mite had developed a resistance to organic phosphates [*cf. R.A.E.*, A **47** 322].

Farrier (M. H.), Guthrie (F. E.) & Rabb (R. L.). **Tobacco foliage loss to hornworms and budworms in North Carolina, 1957 and 1958.**—*J. econ. Ent.* **52** no. 4 pp. 761–762, 9 refs. Menasha, Wis., 1959.

Sampling methods were used to determine the loss of tobacco foliage due to hornworms (*Protoparce sexta* (Joh.) and *P. quinquemaculata* (Haw.)) and budworms (*Heliothis virescens* (F.) and *H. zea* (Boddie)) in North Carolina in 1957 and 1958. Injury by grasshoppers and other large insects, which was only slight, was included with that due to hornworms. The number of fields examined in each county depended on the tobacco acreage, and samples of 85 plants per field were used. The results indicated that the numbers of leaves of flue-cured tobacco per sample destroyed and (in brackets) the losses in dollars per acre were 1·51 and 1·6 (0·75 and 0·8) for hornworms and budworms, respectively, late in the season in 1957, 0·54 and 2·11 (0·27 and 1·05) early in 1958 and 6·2 and 2·21 (3·08 and 1·09) late in 1958. The corresponding figures for burley tobacco were 1·13 and 5·08 (0·67 and 3·02) for hornworms and budworms, respectively, in 1958.

Schuster (M. F.). **Chemical control of *Tetranychus marianae* McG. on tomatoes in the Lower Rio Grande Valley.**—*J. econ. Ent.* **52** no. 4 pp. 763–764, 5 refs. Menasha, Wis., 1959.

Since it was first reported in the Lower Rio Grande Valley of Texas in 1956 [*cf. R.A.E.*, A **45** 441], *Tetranychus marianae* McG. has appeared each year in destructive numbers and become an important pest of tomato. Parathion and malathion proved ineffective against it, but full-coverage sprays of Trithion, chlorobenzilate and diazinon gave adequate control. As high-volume spraying is sometimes impracticable, investigations were made in 1958 in which dusts applied at 30 lb. per acre were compared with low-volume sprays, prepared from emulsion concentrates and applied at 15 U.S. gal. per acre. Counts made before and after treatment showed that 0·25 lb. demeton and 1 lb. ethion or Trithion, applied in sprays on 9th April, when the plants were 15–18 in. high, did not reduce the mite population below damaging levels, though each gave some control for 20 days, and it appeared that low-volume sprays do not give enough coverage for economic control. In dusts applied once to mature plants between 17th June and 2nd July, 1·5 lb. malathion, 0·6 lb. diazinon and 0·9 lb. chlorobenzilate per acre gave good immediate control, but soon lost their effect, whereas 1·2 lb. ethion, 0·6 lb. Trithion and 0·7 lb. Kelthane reduced populations by 97·4–99·6, 93·1–97·3 and 74–97·2 per cent., respectively, after seven days, indicating good persistence.

Hitchcock (S. W.). **Number of fall generations of *Ooencyrtus kuwanae* (How.) in gypsy moth eggs.**—*J. econ. Ent.* **52** no. 4 pp. 764–765, 2 refs. Menasha, Wis., 1959.

In investigations in southern Connecticut in the late summer and autumn of 1958, samples of about 42 egg-masses of *Lymantria* (*Porthetria*) *dispar* (L.) were collected periodically and examined to find the percentage of eggs parasitised by *Ooencyrtus kuvanae* (How.) and also the proportions of these from which the adult parasites had and had not emerged.

Very few adult parasites had appeared in the field by 2nd September, and most parasitised eggs still contained the parasite larva or pupa; no parasites had emerged from some masses. Adults of *O. kuvanae* were most numerous in the field in the first week in October, and decreasing numbers were found on the egg-masses in successive weeks until the last were seen on 18th November, just before the first frosts. A few females were found under the litter on the ground in midwinter. The total percentage of eggs parasitised remained constant from 2nd September to 2nd December, indicating that the first adults, which emerged in late summer, did not produce another generation in the autumn. This was not due to lack of accessible eggs, as only about 32–34 per cent. were attacked, as compared with about 55 per cent. of those in intact masses in the laboratory under optimum conditions. A few eggs as deep as the fifth layer were successfully parasitised, but only the top two layers were heavily attacked. It is concluded that the impression of multiple generations of *O. kuvanae* in autumn [*cf. R.A.E.*, A **13** 433] is due to the fact that the adults emerge over a considerable period and are long-lived.

Bowling (C. C.). **A comparison of three methods of insecticide application for control of the rice water weevil.**—*J. econ. Ent.* **52** no. 4 p. 767, 2 refs. Menasha, Wis., 1959.

In Texas, a fertiliser is commonly applied to rice just before the first flood water. As this is the proper time for spraying against *Lissorhoptrus oryzophilus* Kuschel, sprays were compared with seed treatments and with applications of mixtures of fertiliser and insecticide for control of this weevil in 1958. Aldrin was used at 8 oz. per acre in a 50 per cent. wettable powder applied to the seed in a slurry, in a spray applied on dry soil, or in 50 per cent. wettable powder or 10 per cent. granules mixed with the fertiliser. The spray and fertiliser were applied on the same day, when the rice was about three weeks old, and the plots were flooded immediately and remained so until harvest. Larval counts made three weeks after flooding showed that all treatments controlled the light infestation that occurred, and all caused highly significant increases in yield. The relative advantages of the three methods are discussed.

Wilson (B. R.). **Egg relationships of *Drosophila* in processed and unprocessed tomatoes in New Jersey.**—*J. econ. Ent.* **52** no. 4 pp. 767–768, 1 graph, 3 refs. Menasha, Wis., 1959.

In New Jersey, *Drosophila* spp. are usually abundant from mid-August until the end of the tomato season, and tomatos reaching the canneries at this time are often heavily infested with eggs and larvae. A study was made in 1956 of the relative numbers of eggs in the harvested fruits and in the final product. Comparison of tomatos with natural growth cracks that had sealed over, tomatos that had been cracked during picking, loading or unloading and a finished product (ketchup) showed that most of the eggs were eliminated during processing and that new cracks contained many more eggs than old ones, suggesting that the final numbers in the product could be reduced by careful handling. Large numbers of eggs in old cracks survived processing, because they continued to develop when sealed over, but fewer remained in the final product, because such tomatos were trimmed more closely than newly cracked ones.

Miller (W. E.). **Preliminary study of European pine shoot moth parasitism in lower Michigan.**—*J. econ. Ent.* **52** no. 4 pp. 768–769, 5 refs. Menasha, Wis., 1959.

Surveys of the parasites attacking *Rhyacionia buoliana* (Schiff.) on pine in Michigan were made in two localities in 1958. Parasitism of the eggs, all apparently by *Trichogramma minutum* Ril., averaged 4 per cent., and parasitism of the young larvae in summer averaged 6 per cent. and was due to *Hyssopus thymus* Gir., which overwinters as a pupa in the larval tunnel and gives rise to another generation in the spring. Parasitism of older larvae and pupae in spring averaged 4 per cent., *H. thymus* being the most abundant species, followed in order by the solitary internal pupal parasite, *Itoplectis conquisitor* (Say), and two solitary external larval parasites, *Ephialtes* (*Calliephialtes*) *comstockii* Cress. and *Eurytoma pini* Bugbee; all are indigenous, and all but *H. thymus* have only one generation a year in *R. buoliana*. Similar results have been obtained in other eastern States, and as host populations tend to be lower, parasitism heavier and parasite species more numerous in Europe, the introduction of European parasites might be beneficial.

Frick (K. E.). **Further comparative toxicity tests against the western cherry fruit fly.**—*J. econ. Ent.* **52** no. 4 pp. 769–770, 2 refs. Menasha, Wis., 1959.

Tests of emulsion sprays against adults of *Rhagoletis cingulata indifferens* Curr. on cherry in eastern Washington [*cf. R.A.E.*, A **46** 217] were continued in the laboratory, by the same methods as before, during the winter of 1957–58, although the fly had decreased in importance as a result of spraying. Dibrom (dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate), parathion, Korlan (O,O-dimethyl O-2,4,5-trichlorophenyl phosphorothioate) and Guthion had LD95's of 0·0245, 0·063, 0·068 and 0·13 per cent. actual insecticide; Dibrom rapidly loses its effect and would be useful to give a quick knockdown just before or during harvest. Limited tests showed that parathion was about four times as toxic as Thiodan or ethion, and about three and 1½ times as toxic as Trithion at the LD50 and LD95, respectively.

In a field test, sprays of 1 U.S. pint parathion or 0·25 lb. Korlan per 100 U.S. gal. were applied on 20th May and 2nd and 11th June. Adults were numerous in the Korlan plots within 2–3 days of each application but scarce in the parathion plots, and averages of 2·5, 12 and 33 per cent. of the cherries picked on 21st June were infested in the plots treated with parathion and Korlan or left untreated, respectively.

Gentry (J. W.). **Japanese beetle appraisal survey in outlying areas, 1958.**—*J. econ. Ent.* **52** no. 4 pp. 771–772. Menasha, Wis., 1959.

Despite internal quarantine restrictions in the eastern United States, *Popillia japonica* Newm. spread to isolated places in nine States surrounding the generally infested area, and important infestations have developed recently at some of these. A survey made in 1958 showed that infestations were widely scattered in the outlying States; they occurred in 118 counties south and west of the federally regulated areas, involving over 1¼ million acres in South Carolina, Georgia, Kentucky, Ohio, Illinois and Indiana,

extensive and complex areas in the non-regulated parts of North Carolina, Virginia and West Virginia, and small areas in Iowa, Michigan, Missouri and Tennessee. Collections in 31 fresh localities in 1958 indicated the need for increased efforts at detection. Most reports in the non-regulated areas were from householders, notifying damage to ornamental plants.

Cuthbert jr. (F. P.), Reid jr. (W. J.) & Day (A.). **Parathion on cover crop and fallowing for control of southern potato wireworm.**—*J. econ. Ent.* **52** no. 4 pp. 772–773, 2 refs. Menasha, Wis., 1959.

Surveys in South Carolina in late autumn and winter during 1955–57 showed that larval populations of *Conoderus falli* Lane, an important pest of potato [*cf. R.A.E.*, A **46** 63, etc.], were consistently low in fields in which the summer and autumn cover crops had been treated with parathion or in which autumn vegetable crops had been planted. As the larvae that cause most of the damage to spring potato crops hatch from eggs laid between late August and early October in the previous year, the effects of applying parathion to the cover crop to kill the adults before they oviposit or the newly hatched larvae before they leave the soil surface and of keeping the soil fallow during the oviposition period were tested in 1958.

Parathion was applied at 2 lb. per acre in 100 U.S. gal. emulsion spray or in 5 per cent. granules, and the treatments gave 98 and 100 per cent. reduction of wireworms on 7th November when made on 9th September and 90 and 86 per cent. when made on 9th October, as compared with 79 per cent. reduction on plots that were kept practically free of vegetation by disking or harrowing seven times at intervals of 10–17 days between 15th July and 23rd September. The reductions in population on 5th December were 89 and 80 per cent. after spray applications on 9th October and 10th November and 98 per cent. after granule applications on 9th October, and there was 78 per cent. reduction on 5th January after the November spray. Dead adults were found soon after the September application, which was the most effective. The populations in the fallow plots were considered potentially dangerous, and the practice is undesirable, as it depletes the organic matter in the soil.

Ludvik (G. F.). **A simple rearing cage.**—*J. econ. Ent.* **52** no. 4 pp. 773–774, 1 fig. Menasha, Wis., 1959.

The author describes the construction of inexpensive, rapidly assembled and easily cleaned cages, for the rearing and testing of insects, from such things as cooking pans, wire netting, hardware cloth, S-hooks and rubber bands.

Hofmaster (R. N.). **Effectiveness of new insecticides against the harlequin cabbage bug on collards.**—*J. econ. Ent.* **52** no. 4 pp. 777–778, 1 ref. Menasha, Wis., 1959.

As the recommended treatment with 20 per cent. sabadilla dust against *Murgantia histrionica* (Hahn) [*cf. R.A.E.*, A **45** 279] has recently given unsatisfactory protection of cruciferous vegetables in south-eastern Virginia,

20 other insecticides were compared with it in plot tests in 1957. They were applied in 100 U.S. gal. water per acre, trichlorphon (Dylox) in a soluble powder and all other materials in emulsion concentrates, and counts of adults and last-instar nymphs showed that 0·5 lb. Sevin or Thiodan per acre gave complete knockdown in six hours, 0·5 lb. demeton, endrin, phorate (Thimet), Phosdrin or Dibrom (dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate) in 24 hours, and 0·5 lb. Trithion and 1 lb. trichlorphon in 72 hours. Statistical analysis showed that DDT, ethyl-DDD (Perthane), sabadilla and P-chloro-2,4-dioxa-5-methyl-P-thiono-3-phosphabicyclo(4.4.0)decane were significantly less effective than other insecticides against the adults, permitting extensive feeding, and similar results were obtained with the nymphs, though these were easier to control. A mixture of 0·25 lb. parathion and 2 lb. toxaphene was more effective than either alone, giving complete knockdown in 72 hours in the tests and complete control in commercial plantings of broccoli and cabbage when applied at intervals of seven days, but both the mixture and Dibrom were less effective in an earlier test during hot, dry weather than in September [*cf.* **38** 26].

Jones (S. C.). **Systemic insecticides for the control of the black cherry aphid.**—*J. econ. Ent.* **52** no. 4 pp. 778–779, 1 ref. Menasha, Wis., 1959.

Myzus cerasi (F.) severely injures cherry in the Willamette Valley of Oregon and is not easy to control by conventional sprays. Small-plot experiments with systemic insecticides, applied to young trees in sprays or in paints applied to the trunk to a height of one foot, were begun on 1st July 1954. Counts made 15 days later showed no aphids on trees sprayed with emulsion concentrates containing 26·2 per cent. demeton or 48 per cent. Am.Cyanamid 12008 (O,O-diethyl S-isopropylthiomethyl phosphorodithioate) diluted at 1:1,600 or painted with concentrates containing 13·1 or 26·2 per cent. demeton or 24 or 48 per cent. 12008, but averages of 16 and 41 on trees sprayed with a 48 per cent. concentrate of Am.Cyanamid 12009 (O,O-diethyl S-propylthiomethyl phosphorodithioate) diluted to 1:800 and 1:1,600, respectively, and 7 on those painted with a 24 per cent. 12009 concentrate, as compared with 149·2 on untreated trees. Spraying did not injure the trees, but painting caused discoloration and flecking of the bark near the cambium layer.

In tests in three orchards in 1956–58, pre-blossom sprays of the 26·2 per cent. demeton concentrate diluted to 1:800 or a 48 per cent. phorate (Thimet) emulsion concentrate (1:400), applied in late March or early April, and petal-fall sprays of the demeton concentrate (1:1,600), applied on 30th April, eliminated aphids from terminal tips. When wettable sulphur was added as a fungicide to a pre-blossom application of the demeton concentrate (1:800), 12 tips were infested, as compared with 427 on untreated trees. No residues were detected at harvest in cherries from trees treated with demeton.

Cuthbert jr. (F. P.), Reid jr. (W. J.) & Day (A.). **Evaluation of certain insecticides for southern potato wireworm control.**—*J. econ. Ent.* **52** no. 4 pp. 780–781, 4 refs. Menasha, Wis., 1959.

In view of the development of resistance to certain insecticides by *Conoderus falli* (Lane) attacking potatoes in Charleston County, South Carolina, in 1956 [*cf. R.A.E.*, A **46** 63], other compounds were tested

against the larvae in 1957–58. DDT at 20 lb. per acre gave generally satisfactory control in 1957, but the results were erratic, especially in soils rich in organic matter. Parathion was toxic in laboratory tests at 0·5 lb. per acre, and it gave good control in small-scale field tests in the autumn and winter of 1957 at 1–4 lb. and adequate protection in commercial potato plantings in the spring of 1958 at 2–4 lb.; no residues were found in tubers grown in soil treated with 2–8 lb. per acre just before planting, and the effect of 2 lb. parathion per acre lasted only about five weeks, so that some larvae were not reached.

In field-plot tests, the most promising of 73 compounds tested in the laboratory were applied on 30th–31st October in 100 U.S. gal. emulsion spray per acre, unless otherwise stated. Counts made 33 days later showed that 0·7 lb. Am.Cyanamid 18133 (O,O-diethyl O-2-pyrazinyl phosphorothioate) caused 96 per cent. reduction of wireworms, and that 0·94 lb. phorate (Thimet) per acre in granules, 1 lb. parathion, 4 lb. Shell SD 4402 (1,3,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanophthalan) and 10 U.S. gal. 40 per cent. ethylene dibromide per acre (this last poured into six-inch holes and covered with soil) caused 93 per cent.; 1 lb. diazinon was rather less effective. The sprays and granules were mixed into the top four inches of soil within 1½ hours. Cage tests in which larvae were introduced into soil from the treated plots showed that the mortality percentages 36 and 83 days later were 100 and 80 for SD 4402, 89 and 33 for 18133, and 56 and 40 for diazinon, respectively, and that phorate, though giving inconsistent results, was better than parathion, which had practically no effect.

Schopp (R.) & Landis (B. J.). **Fumigation effect of Thiodan against the green peach aphid on potatoes.**—*J. econ. Ent.* **52** no. 4 pp. 781–782, 1 ref. Menasha, Wis., 1959.

Thiodan gave better control of *Myzus persicae* (Sulz.) on potato in eastern Washington when applied from the air than from ground sprayers or dusters, and a fumigant effect was suspected. In laboratory tests, all aphids were killed when enclosed for one day with a small amount of a miscible concentrate of 2 lb. Thiodan per U.S. gal., either absorbed on filter paper or diluted in water, but 100, 18, 24 and 10 per cent. survived exposure to 10 ml. concentrate in 1 U.S. gal. jars kept sealed for 15, 30, 45 and 60 minutes, respectively, though all but one of the last group were paralysed; larvae of *Hippodamia convergens* (Guér.), which preys on the aphid, were apparently unaffected.

When glass plates were each treated with a drop of the concentrate and put in glass jars with aphids immediately or after one hour or more of exposure indoors or outside in sunlight, all aphids were killed by enclosure with the freshly treated plate, but none died in the other jars, indicating that the compound had been lost by exposure for even one hour. When the concentrate was exposed in the laboratory for five seconds and 5–60 minutes, all aphids were killed by it after the first exposure, and mortality in the other jars showed that Thiodan lost half its toxicity in five minutes, two-thirds of it in ten and all in 30 minutes. None of the treatments appeared to have any effect on adults of *Hippodamia*.

It is concluded that Thiodan acts as a fumigant, evolving a toxic vapour rapidly on exposure to air, as well as a contact insecticide. It has no such action on the Coccinellid, and the resulting combination of biological and chemical control in the field avoids the need for a long-lasting insecticide, with the danger of poisonous residues.

Fisher (T. W.). **Use of flashed opal glass for detecting parasitized Coccids.** —*J. econ. Ent.* **52** no. 4 p. 782, 1 fig. Menasha, Wis., 1959.

It is pointed out that microscopic detection of the presence of parasites in Coccids by transmitted light is facilitated by placing the latter on opal instead of clear glass, as it diffuses the light and reduces refraction and reflection.

Flanders (S. E.). **Biological control.**—*J. econ. Ent.* **52** no. 4 pp. 784–785, 6 refs. Menasha, Wis., 1959.

The author discusses some of the principles involved in the biological control of insects attacking agricultural crops by means of their natural enemies.

DePew (L. J.). **Chemical control of army cutworms in sugar beets.**—*J. econ. Ent.* **52** no. 4 p. 785, 2 refs. Menasha, Wis., 1959.

Chorizagrotis auxiliaris (Grote) severely injured seedling sugar-beet in one corner of a 35-acre field in south-western Kansas in the spring of 1958. When applied to the plants and soil surface in 17 U.S. gal. emulsion spray per acre in the late afternoon at a temperature of about 75°F., 0·2 lb. endrin, 2 lb. DDD (TDE) and 0·375 lb. dieldrin per acre gave 94, 83 and 78 per cent. control after seven days and were significantly better than 0·5 lb. heptachlor or aldrin, 2 lb. toxaphene or 1 lb. Thiodan, which gave 33–50 per cent. control and were considered inadequate.

Watts (J. G.). **Tubulifera thrips damage lettuce.**—*J. econ. Ent.* **52** no. 4 p. 786, 2 refs. Menasha, Wis., 1959.

Haplothrips clarisetis Priesn., which has apparently only recently appeared in the United States, caused severe damage to a field of young lettuce at Mesquite, New Mexico, in March 1959. Up to 36–48 adult females were found on some 4- to 8-leaved plants, whereas adjacent ones had none; typical thrips injury was found on the undersides of the leaves, and half or more of the plants were killed. A few nymphs and possibly some eggs, but no males, were found. Lighter infestations occurred in other lettuce fields and also on onion. The thrips was also recently observed in southern California, but caused no economic damage.

Gustafson (J.) & Morrison (F. O.). **Above ground activity of the clover root borer.**—*Ann. ent. Soc. Quebec* **3** (1957) pp. 11–20, 1 graph, 6 refs. Quebec, 1958.

Although no major flight of the clover root borer [*Hylastes obscurus* (Marsham)] to clover occurred near Macdonald College, Quebec, in 1957, small numbers of adults were captured in traps or taken by sweeping in a field of red clover throughout May–July. Trap-captures in 1954 [*cf. R.A.E.*, A **46** 313] and 1956 were more restricted in time, being limited to the first half of May and to late May and early June, respectively. About 20 per

cent. of the clover roots were infested by 3rd November 1956, the first year of the crop, but in 1957 there was practically 100 per cent. infestation by 24th June, and the number of borers per plant increased until late in the season; adults taken then oviposited in the laboratory. The authors conclude that such infestation is the result of continuous above-ground activity, and that this is part of the normal behaviour of *H. obscurus*.

PARENT (B.). **Essais d'acaricides sur le tétranyque rouge du pommier, *Metatetranychus ulmi* (Koch), dans le Québec.**—*Ann. ent. Soc. Quebec* **3** (1957) pp. 21–27, 8 refs. Quebec, 1958.

In plot tests for the control of *Panonychus* (*Metatetranychus*) *ulmi* (Koch) on apple in Quebec between 1950 and 1954, 12 acaricides were applied in late July or early August when the number of active stages was at least 10 per leaf. Results were assessed by counts made 3–5 days after spraying and again 10–12 days later so that the ovicidal effects could be ascertained. The tests in 1950 and 1951 demonstrated the efficiency and persistence of chlorfenson (Ovotran), Genite (M-923) and EPN, and those in 1953 and 1954 showed that malathion was equal in effectiveness to parathion and almost as effective as chlorfenson when used at a sufficient dosage. Chlorfenson and Genite were more persistent than parathion or malathion, and it is recommended that the latter compounds should be used only when insects and mites need control simultaneously, or in late applications when residue hazards are a consideration.

ROBERT (A.). **Recherches sur le cycle évolutif de la saperde de l'orme, *Saperda tridentata* (Oliv.) (coléoptères–Cerambycidae).**—*Ann. ent. Soc. Quebec* **3** (1957) pp. 46–67, 9 figs., 12 refs. Quebec, 1958.

The following is based largely on the author's summary. Larvae of *Eutetrapha* (*Saperda*) *tridentata* (Ol.) are frequently found in the wood of diseased elms in Quebec, particularly in those infected with Dutch elm disease (*Ceratocystis ulmi*) [*cf. R.A.E.*, A **36** 320]. In the south of the Province, about 60 per cent. of the larvae become full-fed in the year in which they hatch, and pupate immediately after overwintering, but the others feed again in spring and overwinter once or occasionally even twice more before pupating. The pupal stage lasts about 20 days, and the adults emerge in June–July, especially during the first two weeks of the period, but there are variations due to local climatic conditions. The adults feed on young leaves for 10–15 days, and the females begin to oviposit during the third week, laying their eggs over about a month in cavities in the bark. The eggs hatch in about ten days.

LEROUX (E. J.). **Importance of second-generation larvae of the codling moth, *Carpocapsa pomonella* (L.) (Lepidoptera: Tortricidae), on apple in Quebec.**—*Ann. ent. Soc. Quebec* **3** (1957) pp. 75–79, 21 refs. Quebec, 1958.

Despite the application of recommended measures against first-generation larvae of *Cydia* (*Carpocapsa*) *pomonella* (L.) on apple in Quebec, severe damage by the second generation has in recent years not been prevented.

The use of lead arsenate against *Rhagoletis pomonella* (Walsh) in July is thought formerly to have provided some measure of control, but the need for such sprays is no longer warranted, and the peaks of hatching of the two insects seldom coincide. Investigations were therefore made in 1953–57 to assess the importance of the second generation and the possibility of applying measures against it. Most entries by first- and second-generation larvae into apples occurred in the second half of July and in late August, respectively. The percentages of untreated fruits entered by the two generations were 1 and 11·6, respectively, in 1955, 1·2 and 10·5 in 1956 and 2·1 and 8 in 1957. In plots treated against the first generation at Rougemont in 1957 with 2 lb. 50 per cent. wettable DDT, 1 quart 50 per cent. ethyl-DDD (Perthane) emulsion concentrate, 4 lb. 25 per cent. wettable ethyl-DDD, 6 lb. wettable ryania and 3¾ lb. lead arsenate per 100 gal., the percentages of fruits entered by the first and second generations were 0·5 and 2·1, 1 and 7·3, 1 and 12·5, 1 and 13·8, and 3 and 6·2, respectively. At Havelock, the percentages were 5 and 5 in fruits sprayed in 1955 once with lead arsenate against the first generation and twice with DDT against the second, and 8 and 9 in 1957 in those sprayed once with lead arsenate and twice with DDT against the first generation and five times with DDT against the second. In 1956, when one application of lead arsenate and three of DDT were made against the second generation only, 15 and 60 per cent. of the fruits were entered by the two generations, respectively.

Martineau (R.). **La tordeuse des bourgeons de l'épinette (*Choristoneura fumiferana* (Clem.)) dans la province de Québec de 1939 à 1958.**—*Texte Conf. Corp. Ingén. for. Québec 1958* pp. 17–31, 3 maps, 24 refs. Quebec, 1958.

The author reviews the literature on the spread of *Choristoneura fumiferana* (Clem.) on spruce and fir (*Abies balsamea*) and the damage caused in the Province of Quebec in 1939–58 [*cf. R.A.E.*, A **47** 505], and considers some of the ecological factors involved [*cf.* **46** 314, etc.]. The outbreak is now apparently subsiding.

Ghent (A. W.) & Wallace (D. R.). **Oviposition behavior of the Swaine jack-pine sawfly.**—*For. Sci.* **4** no. 3 pp. 264–272, 2 figs., 8 refs. Washington, D.C., 1958.

The following is virtually the authors' summary. *Neodiprion swainei* (Middleton) had been described as laying its eggs in pairs on the needles of the jack-pine (*Pinus banksiana*) [*cf. R.A.E.*, A **32** 1]. In investigations in Quebec, the appropriate binomial calculations satisfied the observed distribution of eggs on both, one or neither of the pair of needles that arise from a common base, so that the existence of a pairing behaviourism cannot be supported. A gradient in egg position was discovered, such that the distance from egg slit to needle tip is greater on needles near the base of the shoot, and declines steadily towards the shoot tip. This gradient was related to a similar gradient in the exposure of the developing needles from the basal sheath during the spring growing season. Oviposition takes place as close as possible to the apical edge of the basal sheath, subsequent growth of the needle carrying the egg slit away from the basal sheath and preserving the original distance between egg slit and needle tip. The behaviour of this species is therefore essentially the same as that of *N. hetricki* (Ross), which lays a single egg as close as possible to the basal

sheath of the mature (6–9 in.) foliage of loblolly pine (*Pinus taeda*). Possible avenues of speciation that may link these species are discussed.

Blanchard (E. E.). **Dos nuevos microgastrinos útiles para la agricultura (Hym. Braconidae).** [Two new Microgasterines useful for agriculture.] —*Rev. Invest. agríc.* **13** no. 2 pp. 151–155, 2 figs. Buenos Aires, 1959.

Descriptions are given of the adult females and cocoons of *Apanteles gaytotini* and *A. lavignei*, spp.n. The first was reared from larvae of *Sarsina purpurascens* (Wlk.), which infest *Eucalyptus* spp. in Misiones, Argentina, and the second, of which only one example was available, from a larva of *Pilocrocis infuscalis* (Gn.), a pest of tomato in Bahia, Brazil.

Heinrich (W. O.). **Contribuição para o conhecimento dos hábitos e do combate ao *Cerococcus catenarius* Fonseca, 1957, praga do cafeeiro.** [Contribution to knowledge of the habits and control of *C. catenarius*, a pest of coffee.]—*Biológico* **25** no. 4 pp. 71–79, 4 refs. São Paulo, 1959.

Cerococcus catenarius Fonseca has recently become an important pest of coffee in the Brazilian States of São Paulo and Paraná [*cf. R.A.E.*, A **47** 379, 381]. The infestation spreads from roadways into the interior of plantations, covering about 20 rows a year, and the Coccid is apparently favoured by the presence of dust. The females lay an average of 893 eggs each, and the nymphs settle on the young branches with soft bark, especially in cracks giving access to the underlying tissues. As they grow, they become covered by the plant tissues, and heavy infestation causes withering and death of the whole plant. The process is slow, but yield is affected long before plant death. Hatching was found to occur between July and mid-September in São Paulo and in the first half of October in northern Paraná.

In tests in São Paulo, atomised sprays were applied on 19th September, 1st October and 14th November 1958, and counts of the living Coccids on branch samples on 27th January 1959 showed percentage reductions of 27·9 for 1 per cent. oil emulsion, 99·2, 98·9 and 99·9 for low-volume emulsion sprays of 0·42 per cent. diazinon, 0·7 per cent. malathion and 0·14 per cent. parathion, respectively, and 89·6, 91·6 and 94·1 for 1 per cent. oil emulsion with 0·06 per cent. diazinon, 0·1 per cent. malathion and 0·02 per cent. parathion, respectively. Diazinon, malathion and parathion alone thus gave excellent results, and directions for their use are given.

Campacci (C. A.). **Ocorrência do "ácaro branco" em batatinha.** [The occurrence of *Hemitarsonemus latus* on potato.]—*Biológico* **25** no. 6 pp. 111–114, 1 fig., 5 refs. São Paulo, 1959.

Mites found on potato plants treated with experimental fungicides at a place in São Paulo in March 1959 were identified as *Hemitarsonemus latus* (Banks), which does not usually infest this crop. They did not occur in such numbers on plants sprayed with bordeaux mixture, which may have had a repellent effect. The symptoms caused are described, and it is stated that two spray applications of diazinon at 1 lb. per 100 gal. with an interval of five days afforded good control.

Magalhães Silva (G.) & de Oliveira (A. J.). **Experiments on control of the pests of the yellow lupin** (*Lupinus luteus* **L.**).—*Agron. lusit.* **21** no. 1 pp. 43–74, 1 map, 8 refs. Sacavém, 1959. (With a summary in Portuguese.)

Yellow lupin (*Lupinus luteus*) is grown for grazing and fodder in Portugal on sandy soils south of the Tagus, but is severely infested by *Sitona gressorius* (F.) and *S. griseus* (F.), which destroy the root nodules, *Hylemyia cilicrura* (Rond.) (*cana* (Macq.)), which develops in the stems of the seedlings, and cutworms. In experiments on control, the best results were given by a 25 per cent. dieldrin wettable powder applied at 5·4 lb. per acre in sprays at the time of sowing, which remained effective for at least two years after application.

Pires (M. do C. V.). *Carpophilus hemipterus* (**L.**) (**Coleoptera–Nitidulidae**) **praga do figo armazenado.** [*C. hemipterus*, a pest of stored figs.]—*Rev. agron.* **42** pp. 1–56, 30 figs., 5 graphs, 51 refs. Lisbon, 1959. (With summaries in English & French.)

Carpophilus hemipterus (L.) is an important pest of stored figs in Portugal. All stages of the Nitidulid and its life-cycle are described. In tests, the duration of the egg stage ranged from 1–3 days at an average temperature of about 29–30°C. [84·2–86°F.] and a relative humidity of 63–70 per cent. to 3–6 days at 17–18°C. [62·2–64·4°F.] and 60–80 per cent., the larval stage from 10–17 days at about 30°C. [86°F.] to about 40 days at 18–19°C. [64·4–66·2°F.], both at about 70 per cent. relative humidity, and the pupal stage from 4–6 days at about 29°C. to 8–12 days at about 20°C. [68°F.] and 50–80 per cent. relative humidity. Moisture of the substrate was important, a water content of some 25–30 per cent. being preferred. In experiments on control, the larvae proved harder to kill than the adults and γ BHC gave the best results against them, followed by DDT and a mixture of pyrethrins and piperonyl butoxide, but DDT lost its toxicity when applied to figs. Good control was obtained in figs when γ BHC was used in a dust at 15 parts per million and the pyrethrins mixture at 32 p.p.m. pyrethrins.

Schvester (D.). **Considérations sur les diverses méthodes de lutte contre la bruche du haricot** (*Acanthoscelides obsoletus* **Say**).—*Rev. Zool. agric.* **57** no. 7–9 pp. 89–101, 3 refs. Talence, 1958.

Cultural and chemical methods for the control of *Acanthoscelides obtectus* (Say) (*obsoletus*, auct.) on haricot beans in the field were examined in France in 1955–56, with the object of reducing subsequent damage to the stored beans. Early sowing proved of no value, for plants of a given variety took longer to reach maturity when seed was sown early than when it was sown later, but early harvesting and threshing were advantageous [*cf. R.A.E.*, A **46** 194] and resistant varieties can be used; in one test, the percentage of infested pods at harvest was 27 in one variety and six in another. A spray of 0·3 lb. wettable parathion applied when 10 per cent. of the pods had dried and again eight days later was the best of the chemical measures tested; the percentage of infested beans was 0·14 at harvest, as compared with 7·3 for no treatment and 4 for two applications of 2 lb. wettable DDT per 100 gal. The value of parathion was confirmed in 1957,

when a late-sown crop was sprayed on 15th and 21st August and the corrected infestation rate was 2–2·2 per cent. at harvest on 2nd September, as compared with 12·8–14·2 per cent. on an untreated plot. The infestation of beans stored with an initial infestation rate as low as 2 per cent. is considered mathematically and shown to be capable of rising to 50–100 per cent. by the third generation. As complete control in the field is not possible, it is recommended that the beans should be harvested as soon as possible. Supplementary control measures are required on the stored beans, and recommendations are made from earlier work [**47** 490].

Labeyrie (V.). **Observations sur l'écologie de la mouche du céleri** (*Philophylla heraclei* **L.**) **dans le Bordelais.**—*Rev. Zool. agric.* **57** no. 7–9 pp. 127–131, 9 refs. Talence, 1958.

The effects of temperature on the development of *Euleia (Philophylla) heraclei* (L.), a pest of celery, were studied in south-western France. Adults of the overwintered generation emerged between 15th April and 10th May, and those of the first generation from 10th September; they were active at temperatures above 20°C. [68°F.] and mated at once, although eggs were not laid until four days later, after the females had fed on sugar. The adults lived for up to 73 days at 15°C. [59°F.] and survived exposure for ten days to −5°C. [23°F.]. The eggs are laid in the leaf parenchyma of various umbelliferous plants, especially celery, usually on the lower surfaces of the leaves [*cf. R.A.E.*, A **47** 213–214]. The incubation period varied from a mean of three days at 25°C. [77°F.] to ten days at 16°C. [60·8°F.], but there was variation between the eggs laid by different females. Larval development required 7, 10 and 23 days at 30°C. [86°F.], 25°C. and 18°C. [64·4°F.], respectively. Larvae were found in leaves in late November 1950, after seven days of frost with a minimum soil temperature of −4°C. [24·8°F.], and in the laboratory larvae survived exposure for 6–72 hours to a temperature of −2°C. [28·4°F.], although there was 5·5 per cent. mortality after exposure for 120 hours. The larvae enter the soil when full-fed, and the pupal stage lasted 15 and 139 days at 26°C. [78·8°F.] and 16°C., respectively, but examination of puparia during the winter showed that pupation had not taken place and that the Trypetid did not undergo a true diapause, but was capable of further development whenever the temperature became favourable. Adults emerging in spring were almost all of the reddish-brown form (*onopordinis* (F.)) and those emerging in September were of the black form (*centaureae* (F.)). Pupae kept from 25th September in almost saturated soil with a minimum temperature before 15th October of 17°C. [62·6°F.] gave rise to adults of the black form from 12th November, whereas others kept for eight or ten days at −10°C. [14°F.] and then at 25°C. produced reddish-brown adults from 15th December.

Chaboussou (F.) & Schvester (D.). **Une menace pour le pêcher: présence en Gironde et dans les Landes de la cochenille japonaise du murier** (*Pseudaulacaspis pentagona* **Targ.**).—*Rev. Zool. agric.* **57** no. 10–12 pp. 170–178, 2 figs., 6 refs. Talence, 1958.

The authors record the finding of *Pseudaulacaspis pentagona* (Targ.) on peach and other plants in a suburb of Bordeaux, in the district of Soulac-sur-mer, and at Tarnos, near the Pyrenees, and review its food-plants, bionomics and control. It had not previously been found so far to the west in France.

Kotte (W.). **Krankheiten und Schädlinge im Gemüsebau und ihre Bekämpfung.** [Diseases and pests of vegetables and their control.]—3rd revd. edn., $9\frac{1}{4} \times 6\frac{1}{4}$ in., xi + 374 pp., 8 col. pls., 160 figs., $13\frac{1}{2}$ pp. refs. Berlin, P. Parey, 1960. Price *DM.* 50.

This third edition of a well-known text-book on the diseases and pests of vegetables and their control in Germany [*cf. R.A.E.*, A **40** 399] has been revised and expanded in view of recent advances in the subject, but the general arrangement remains the same. Increased attention is paid to virus diseases, some of which are transmitted by insects, and potatoes and herbs are now excluded, since specialised texts on them are readily available.

Eis (F. H.). **Der Gefurchte Dickmaulrüssler als Rebschädling.** [*Otiorhynchus sulcatus* as a pest of vines.]—*Weinb. u. Keller* **4** pp. 387–397, 11 refs. Frankfurt am Main, 1957.

Hering (M.). **Weitere Versuche und Erfahrungen zur Bekämpfung des Gefurchten Dickmaulrüsslers** (*Otiorrhynchus sulcatus* **F.).** [Further tests and experiments on the control of *O. sulcatus*.]—*Op. cit.* **5** pp. 239–247, 2 figs., 3 refs. 1958.

In the first of these papers, the author surveys the extent of the damage caused to vines in western Germany by *Otiorhynchus sulcatus* (F.), which has increased greatly in severity in the past ten years. Control can be achieved by treating the stocks with DDT or a phosphorus insecticide and the soil with chlordane or aldrin.

The second paper contains details of further tests on control of the adults, from which it is concluded that DDT, parathion, Chlorthion and malathion are effective only as stomach poisons when applied in sprays, whereas they also have a contact effect in dusts. Broadcast applications of aldrin, chlordane and a mixture of γ BHC and dieldrin give rapid kill, and such treatments applied to the soil also control the larvae. They should be applied in spring.

Becker (H.). **Zur Bekämpfung der Blattreblaus durch Winterspritzung.** [On the control of the leaf form of *Phylloxera vitifoliae* with winter sprays.]—*Weinb. u. Keller* **5** pp. 535–541, 15 refs. Frankfurt am Main, 1958. **Untersuchungen zur Verbesserung der Rebenentseuchung im Tauchverfahren.** [Investigations on the improvement of vine disinfestation by dipping methods.]—*T.c.* pp. 563–572, 11 refs.

It is stated in the first of these papers that control of the leaf form of *Phylloxera vitifoliae* (Fitch) is necessary on vine cuttings in western Germany to prevent the rapid spread of infestation [*cf. R.A.E.*, A **40** 373]. Winter sprays of tar distillates of the type known as emulsified carbolineums [*cf.* **35** 70] are prescribed for use on nursery cuttings and are effective against the winter eggs and fundatrices, but are no longer officially approved insecticides. A proprietary preparation of γ BHC (lindane) in oil, named Hortex, to be used at a dilution of 0·5 per cent., was therefore tested as a substitute. The tests were carried out in northern Italy in 1958 and showed that sprays of Hortex very thoroughly applied gave complete or almost complete control, with no scorching, on cuttings treated before or after the resumption of growth and were as good as or better than dormant applications of tar distillate. Less careful application led to inferior control.

The second paper is concerned with the control of *P. vitifoliae* on young vines for planting, and existing methods are reviewed. Dipping in tar distillates is effective but has disadvantages, and dips containing BHC were therefore compared with tar distillate in tests begun in the Palatinate during the growing period of 1956. The results showed that Hortex and similar emulsion dips of technical or γ BHC gave complete control, with no scorching, and were as effective as tar distillates. Subsequent growth was excellent.

Schwenke (W.). **Über die Standortabhängigkeit des Massenwechsels der Lärchenminiermotte,** *Coleophora laricella* **Hb., und der Ahorneule,** *Acronycta aceris* **L.** [On the dependence on tree site of population fluctuations of *Coleophora laricella* and *Apatele aceris*.]—*Beitr. Ent.* **8** no. 3–4 pp. 241–290, 3 figs., 43 refs. Berlin, 1958. (With summaries in English & Russian.)

The author discusses basic principles in the comparative biocoenotic study of insect populations, with special reference to his own observations [*cf. R.A.E.*, A **41** 337; **43** 63; **44** 250], and gives the results of detailed investigations on the population dynamics of *Coleophora laricella* (Hb.) on larch in different environments and years and of *Apatele* (*Acronicta*) *aceris* (L.) on broad-leaved trees in Berlin.

The investigations on *C. laricella* were carried out in 1953, 1955 and 1957 in 22 localities near Berlin, Dessau or Leipzig in stands containing trees 10–25 years old growing under similar macroclimatic conditions but on sites characterised by different amounts of soil water and different ground floras. The numbers of pupae per 100 short shoots on European larch (*Larix decidua*) in May did not, on the whole, vary very widely with year but were over 40 on trees growing on dry soil with ground vegetation of the grass-*Calluna* type, 15–35 when the vegetation was of the *Vaccinium-Rubus* type and under 10 on damp soil with vegetation of the *Anemone-Ranunculus* (-*Ficaria*) type. They were also lower in the parts of stands exposed to wind than in the interior, but increased with exposure to light, so that they were greatest at the edges of stands not exposed to wind, which evidently constituted the most favoured oviposition sites. When freshly emerged females were taken from each of the three types of forest floor in 1953 and each was caged with a male in the open and supplied with fresh larch twigs, the numbers of eggs laid and of mature eggs remaining in the ovaries after death together totalled 36·6, 46 and 50·6, respectively. The amount of damage caused to the trees was not proportionate to the infestation, and assessment of the loss of chlorophyll in the needles showed that although this was 30 per cent. in places where the numbers of pupae per 100 short shoots averaged 30, it was 75 per cent. where the numbers rose to 50 and 5 per cent. where they fell to 10. Japanese larch (*L. leptolepis*) was equally heavily infested, but damage to it was less severe, evidently owing to the greater number of needles per short shoot. Males were somewhat more numerous than females but neither the sex ratio nor pupal parasitism, which ranged from 1 to 34 per cent., could be related to type of soil or to year, parasitism probably depending on the presence of alternative hosts in the vicinity of a particular tree.

The outbreak of *Apatele aceris*, in which horse chestnut (*Aesculus hippocastanum*) suffered considerable defoliation, affected most parts of Berlin in 1953, but was limited to the city area and decreased in later years. Adults emerged from the beginning of May to the beginning of

August, so that all stages were present during the summer, but there was only one generation a year. Eggs were laid singly on the lower surfaces of the leaves, and the larvae, which have urticating hairs, left the crowns of the trees from mid-July and pupated in cocoons in crevices in the bark of the trunks, beneath water-butts (a favoured site) and in the eaves or other parts of houses. Infestation was highest in the centre of the city and, in the centre, it was greater on single trees in courtyards than on trees in parks or other open spaces. Investigations were carried out in 1953–56 on trees in park areas and courtyards, and extended in 1955–56 to young oaks in outlying forests, where larvae were rare. Egg production apparently varied little with location, and egg mortality was 9·1–14·3 per cent., being due to fungi and other causes (but not insect parasites). Outdoor rearing of older larvae showed that mortality due to wilt disease averaged 87·4, 78 and 56·3 per cent. in courtyards, parks and forests, respectively, the higher incidence of disease in courtyards being evidently due to the higher population and resulting overcrowding, and mortality due to parasites 3·1, 17·6 and 34·5 per cent., the low parasitism in the first case being evidently due to lack of alternative hosts and probably also to temperature differences. The most important of six larval parasites observed was the Tachinid, *Compsilura concinnata* (Mg.), which overwintered in the host pupa and was responsible for 92·1 per cent. of all mortality due to parasites. Of prepupae and pupae taken in 1954, 12·8 and 14·8 per cent. from courtyards and parks, respectively, gave rise to adults (a quarter and a half of them, respectively, emerging in 1955). Mortality from unknown causes was 67·7 and 57·4 per cent., respectively, and the remaining mortality was due to pupal parasites, of which the most important was *Cratichneumon* (*Ichneumon*) *fabricator* (F.). Larval mortality was the main factor influencing the course of outbreaks, and that due to disease and parasites in courtyards and parks rose from about 95 per cent. in August 1953 to 100 per cent. in August 1954, but the fact that some pupae overwintered for a second time ensured the continuance of the population. Mortality was somewhat lower in the parks, and markedly so in the courtyards, in 1955, there having been a considerable fall in numbers of diseased larvae following the rapid decrease in population and the onset of favourable weather. Mortality rose in both places in 1956. It is concluded that whereas parasitism and disease maintained a fairly constant level in the parks, incidence of disease varied considerably in the courtyards, and when it decreased, the decrease in mortality was not counterbalanced by increased parasitism, thus accounting for the tendency for the worst outbreaks to occur in the courtyards.

Janssen (M.). **Über Biologie, Massenwechsel und Bekämpfung von *Adoxophyes orana* Fischer von Roeslerstamm (Lepidoptera: Tortricidae).** [On the bionomics, population fluctuation and control of *A. orana*.]—*Beitr. Ent.* **8** no. 3–4 pp. 291–324, 17 figs., 51 refs. Berlin, 1958. (With summaries in English & Russian.)

Damage to fruit trees by *Adoxophyes orana* (Fisch. v. Roesl.) became serious near Bonn as early as 1949–50, and investigations on the bionomics and control of the Tortricid were carried out there in 1952–54. The results are recorded and compared with those obtained elsewhere in Europe [*cf.* *R.A.E.*, A **48** 105, etc.]. The larvae were found feeding on 27 plants; among fruit trees, damage was most frequent on apple and pear. The adults of the overwintered generation emerged at about the middle or end of May, males before females. Oviposition continued for several weeks and usually reached a peak in the first half of June. Smooth leaf surfaces were preferred

to hairy ones, and the maximum number of eggs laid per female in the laboratory was 436. The larvae fed mainly on young leaves, destroying large areas of surface. Older ones also fed, always from sheltered positions, on the fruits, chewing more or less deeply into apples and causing them to fall prematurely and penetrating the flesh also of apricot, peach and cherry. Large areas of the skin of pear were attacked. Pupae appeared in the middle and adults at the end of July. Oviposition by the first generation began in the first half of August, lasting several weeks, and the resulting larvae fed largely on the fruits, generally causing shallow injuries. They sought sheltered positions on the trunks and branches or elsewhere at about the beginning of October and hibernated until the first ten days of April, when they attacked the blossoms and young leaves. Pupation occurred in the first half of May.

The eggs were parasitised to a limited extent by *Trichogramma* sp., and the larvae and pupae by various Hymenoptera and Tachinids. *Colpoclypeus silvestrii* Lucchese and *Meteorus ictericus* (Nees) afforded up to about 50 per cent. parasitism of first-generation larvae, and some 30 per cent. of larvae of the overwintering generation were parasitised in autumn by *C. silvestrii* and a varying though usually small number by *M. ictericus* in the spring. Pupal parasites were unimportant. The larvae were also attacked by a polyhedral virus disease. In a test of sprays against first-instar larvae of the overwintering generation, the percentage reduction in population obtained was greatest (95) for 0·1 per cent. DDT.

Patočka (J.). **Beitrag zur Kenntnis des Tannenwicklers** *Epinotia pusillana* **(Peyerimhoff) (Lepidoptera: Tortricidae).** [Contribution to knowledge of *E. pusillana*.]—*Beitr. Ent.* **8** no. 3–4 pp. 325–333, 15 figs., 12 refs. Berlin, 1958. (With summaries in English & Russian.)

Epinotia pusillana (Peyer.), which occurs in various parts of Europe but of which the habits were unknown, was observed in 1955–57 to be fairly widespread on fir [*Abies*] in certain localities in Slovakia and Bohemia. The immature stages of the Tortricid are described, and an account is given of observations on its bionomics in field and laboratory, together with a list of the parasites reared from it. Damage to the needles was only slight.

Hahn (E.). **Untersuchungen über die Lebensweise und Entwicklung der Maulwurfsgrille** (*Gryllotalpa vulgaris* **Latr.) im Lande Brandenburg.** [Investigations on the habits and development of *Gryllotalpa gryllotalpa* in Brandenburg.]—*Beitr. Ent.* **8** no. 3–4 pp. 334–365, 64 refs. Berlin, 1958. (With summaries in English & Russian.)

The distribution of *Gryllotalpa gryllotalpa* (L.) (*vulgaris* Latr.) in Germany and elsewhere is reviewed, and an account is given of investigations on its bionomics carried out in several parts of Brandenburg, in eastern Germany, where it damages a wide variety of plants and is commonest in the vicinity of the Spreewald. Methods of rearing the insect are discussed, and the results are compared with those recorded elsewhere. The adults emerged mainly in July–August, but apparently hibernated before pairing, which occurred at about the beginning of April in warm, dry soil, or even earlier under glass, and usually at about the end of April in places with moist soil that was slow to warm up in the spring. The eggs were laid from about

mid-April, in chambers in the soil excavated at depths ranging from 10 in. in dry soil to about 2 in. in moist soil. At Schöbendorf, however, a locality with moist soil where there appeared to be a separate biological race, pairing did not begin before the end of June or the beginning of July, oviposition began at any time between late July and early September, and the eggs were laid just beneath the surface of the soil. The number of eggs per female was usually 250–350, but ranged up to 640 at the latter place. High temperatures and relative humidities were necessary for optimum development, and particularly so for the eggs. Mortality of ovipositing females due to predators was sometimes considerable, with the result that the eggs already laid became infested with fungi. The eggs developed in as little as 10 days, but some 5–6 weeks were required by those laid in September–October, and few of those laid in November hatched. The nymphs required at least 500 days for development, and those that hatched late in the year did not give rise to adults until the next year but one. The nymphs fed on humus and roots in the chambers and then on roots in the vicinity, so that damage by them was not confined to disturbance of the soil. Cannibalism was common, and the females destroyed up to 90–95 per cent. of their own offspring, while many nymphs were killed by predators. Older nymphs sometimes entered hibernation as early as July, and the younger ones and adults as early as August, hibernation beginning rather later in moist than in dry soil. It occurred at depths of 1–3 ft., and very few individuals overwintered in compost or manure. Exposure to damp and cold killed some 50–60 per cent. of the overwintering population in some places. Six individuals kept in soil in the laboratory for three days at 0°C. [32°F.] resumed activity when returned to room temperature, but only two of them did so after further exposure for a day to −3°C. [26·6°F.]. Behaviour was normal at 40°C. [104°F.] and 90–95 per cent. relative humidity, but death ensued rapidly at 44°C. [111·2°F.].

Barnes (H. F.). **A new stem-inhabiting gall midge of** *Poa pratensis* **(Diptera: Cecidomyiidae).**—*Beitr. Ent.* **8** no. 5–6 pp. 688–692, 1 fig., 6 refs. Berlin, 1958. (With summaries in German & Russian.)

The following is the author's summary. A new species of Cecidomyiidae belonging to the genus *Mayetiola* is described as *M. schoberi*. This species is characterised by the curious hook-shaped terminal sclerotisation of the penis-sheath. Its host plant is *Poa pratensis* and the type locality Ratzeburg (near Lübeck).

Fritzsche (R.). **Zur Kenntnis der Raubinsekten von** *Tetranychus urticae* **Koch (Thysanoptera; Heteroptera).** [Contribution to knowledge of the predators of *T. telarius*.]—*Beitr. Ent.* **8** no. 5–6 pp. 716–724, 25 refs. Berlin, 1958. (With summaries in English & Russian.)

The following is based on the author's summary. Observations in bean fields in eastern Germany in 1954–57 showed that two species of thrips, *Cryptothrips nigripes* (Reut.) and *Scolothrips longicornis* Priesn., and two Heteroptera, *Anthocoris nemorum* (L.) and *Orius* (*Triphleps*) *majusculus* (Reut.), were important predators of *Tetranychus telarius* (L.) (*urticae* Koch). *S. longicornis* was active during the summer, *C. nigripes* attacked the overwintering females, and the Heteroptera occurred in both seasons.

Wilbert (H.). **Der Einfluss des Superparasitismus auf den Massenwechsel der Insekten.** [The influence of superparasitism on changes in the population density of insects.]—*Beitr. Ent.* **9** no. 1–2 pp. 93–139, 4 graphs, 80 refs. Berlin, 1959. (With summaries in English & Russian.)

An outbreak of *Aporia crataegi* (L.) has been in progress in south-western Germany of recent years. The larvae are parasitised by *Apanteles glomeratus* (L.), and advantage was taken of this to study the occurrence of superparasitism by a gregarious parasite. Examination of field-collected larvae showed that the Braconid deposited 1–156 eggs in each host attacked, although an average of only 13 was laid at a time and unparasitised hosts were preferred to already parasitised ones in the laboratory. Theoretically, the degree of superparasitism should vary with the percentage of parasitism, and reasons for the unexpectedly high superparasitism observed are discussed, together with its effects on the population density of host and parasite.

Mashhood Alam (S.). **The life-history in the field and the anatomy of fully-grown larva of** *Doliphoceras pseudococci* **Alam, an endoparasite of** *Pseudococcus newsteadi* **Green (Hymenoptera: Encyrtidae & Hemiptera: Coccidae).**—*Beitr. Ent.* **9** no. 1–2 pp. 189–196, 8 figs., 9 refs. Berlin, 1959. (With summaries in German & Russian.)

Doliphoceras pseudococci Mashd. Alam is an endoparasite of *Pseudococcus newsteadi* Gr. on beech (*Fagus sylvatica*) in Britain. The external and internal anatomy of the larva and the bionomics of the Encyrtid are described, and as parasitism in the field is about 30 per cent., it is suggested that it might prove useful for purposes of biological control. Both host and parasite have one generation a year, the adults of the latter being present from late July to the end of August.

Orphanidis (P. S.). **Recherches expérimentales sur l'attractivité exercée par certaines substances proteinées sur le** *Dacus* **adulte de l'olive.**—*Ann. Inst. phytopath. Benaki* (N.S.) **1** no. 4 pp. 171–198, 3 graphs, 1 fldg. table, 12 refs. Athens, 1958.

Detailed results are given of field tests carried out in Greece in 1957 on the attractiveness to adults of *Dacus oleae* (Gmel.) on olive of several proteinaceous materials used in bait-traps or as bait-sprays also containing 0·75–3 per cent. malathion, and the following is largely based on the author's conclusions from the work. Baits of ammonium sulphate were rendered 3–12 times as attractive by the addition of two proprietary liquid protein baits containing solid matter (49 per cent.), sodium chloride (14·8 and 8·3 per cent., respectively), ammonium chloride (3·8 and 2·9 per cent.) and amino acids and their salts (31·2 and 28 per cent.), which remained effective for 20 days, or of brewers' yeast or casein hydrolysate, which were effective for at least 30 days. The attractants were superior to molasses when applied in bait-sprays to the branches of the trees, but the attractiveness of molasses alone was only slight. Sugar did not augment the attractiveness of the other attractants. The period of attractiveness on the trees did not exceed a fortnight. Aquacel 207, a compound included to maintain the humidity of the baits, increased the attractiveness of the second proprietary material, but not of the other substances. Attractants varied in their effectiveness with changes in atmospheric humidity, and according to whether they were used in liquid or solid form, and, if solid, whether they remained damp. Materials applied in summer to dry substrates, or

when air-drying was rapid, were reduced in efficiency, suggesting that applications in spring or autumn, when relative humidities are high, would be most effective, but the use of liquids in traps sufficiently increased the dampness of baits in summer to give good results.

ORPHANIDIS (P. S.). **Recherches expérimentales sur l'action immédiate et résiduelle exercée par quelques insecticides phosphorés sur le *Dacus* adulte de l'olive.**—*Ann. Inst. phytopath. Benaki* (N.S.) **1** no. 4 pp. 199–218, 3 graphs, 2 fldg. tables, 2 refs. Athens, 1958.

Four organophosphorus insecticides were tested on olive at Roviais, on the Greek island of Euboea, in 1957 for control of the adults of *Dacus oleae* (Gmel.). In the first test, dimethoate (Rogor), diazinon, parathion and malathion, all as emulsion concentrates, and parathion and malathion as wettable powders, were applied in sprays at a dosage of 0·1 per cent. toxicant on 27th August and again at 0·05 per cent. on 12th October and 2nd November. Populations were still low at the time of the first application, but averages of 35·7 and 54·8 adults were killed per tree in 48 hours on the two later dates, respectively. All the compounds gave high initial kills, about 50–60 per cent. of the total kill for the first 48 hours occurring in the first 30 minutes, but only dimethoate continued to give good results for more than about 1–2 days; its effectiveness persisted for about three weeks. In another test in which dimethoate was used as a wettable powder and an emulsion concentrate at concentrations of 0·03 and 0·06 per cent. and parathion and diazinon emulsion concentrates were applied at 0·025 per cent. toxicant, the percentages of fruits punctured averaged 5·6, 14·7 and 12·4 for the three compounds, respectively, on 7th October, as compared with 18 on untreated plots, and 19·8, 36·1 and 45·7 on 11th November, as compared with about 50. Dimethoate applied as a dust on 20th September and 17th October reduced the percentage of fruits punctured from 9·5 to 3·3 on 4th October, from 24·1 to 14·5 on 24th October and from 68·7 to 35·7 on 11th November, but a third application on 1st November had little further effect. It was noted in the spray tests that kills were greater on days following rain.

ORPHANIDIS (P. S.) & KARAYANNIS (G. B.). **Observations concernant l'influence exercée par de hautes températures prolongées sur la population du *Dacus*.**—*Ann. Inst. phytopath. Benaki* (N.S.) **1** no. 4 pp. 219–222, 1 graph, 5 refs. Athens, 1958.

A sudden drop in the numbers of adults of *Dacus oleae* (Gmel.) taken per bait-trap in olive groves at Roviais, on the Greek island of Euboea, from 32 to less than four over a five-day period in mid-August 1957 was not accounted for by a change in the relative humidity, which remained stable during the period, but followed a rise in the maximum temperature to over 35°C. [95°F.].

ORPHANIDIS (P. S.). **La dureté de la surface du fruit de l'olive en corrélation avec l'intensité de l'attaque du *Dacus*. Expériences préliminaires d'application de résines synthétiques pour l'augmentation de la dureté.** —*Ann. Inst. phytopath. Benaki* (N.S.) **1** no. 4 pp. 223–228, 1 graph, 4 refs. Athens, 1958.

In an attempt to elucidate more fully the reason for differences in the varietal susceptibility of olives to attack by *Dacus oleae* (Gmel.) [*cf. R.A.E.*,

A **43** 30], the toughness of the skin of the ripening fruits was investigated by means of a Wallace hardness meter on the Greek island of Euboea in August–November 1957. The toughness of one variety known to be resistant to attack was found to be 3·3 international rubber hardness degrees greater than that of a susceptible variety on 5th August, 3 degrees greater on 25th September and 1·2 degrees greater on 23rd October. Conversely, the percentages of fruits punctured by *D. oleae* on 22nd August and 18–20th November averaged 0·6 and 59·1, respectively, for the susceptible variety and 0 and 11·4 for the resistant one. In an attempt to protect susceptible fruits, synthetic resins (styrene copolymers and polyvinyl acetate) were applied as 1–2 per cent. emulsions in sprays, with an adhesive, to form a tough film on the surface. The films broke down as they dried and contracted, but no punctures due to *D. oleae* were found on microscopic examination of those parts of the fruits still covered 20–60 days after spraying.

Nizamlioglu (K.). *Pulvinaria floccifera* **Westw.**—*Koruma* **1** no. 3 pp. 4–7, 3 figs., refs. [Istanbul] 1960. (With a summary in English.)

Pulvinaria floccifera (Westw.) was found in Turkey infesting tea bushes at Rize in 1950 and is now an important pest of the crop throughout the area of the Black Sea coast. It has one generation a year and has been well controlled by sprays of oil emulsion.

Nizamlioglu (K.). *Rhizotrogus aequinoctialis* (**Herbst.**).—*Koruma* [**1**] no. 4 pp. 20–21, 1 fig. [Istanbul] 1960. (With a summary in English.)

Rhizotrogus aequinoctialis (Hbst.) was observed in Turkey for the first time in 1954, when adults were taken at light, and the larvae caused substantial losses of carnations, *Gladiolus* and lettuce on the Asiatic side of Istanbul in 1958.

Nizamlioglu (K.). **Mısır pamuk kurdu** *Prodenia litura* (**Fabricius**) **nın pamukda zararı ve mücadelesi.** [Damage by the Egyptian cotton worm, *P. litura*, and its control.]—*Koruma* [**1**] no. 5 pp. 4–9, 5 figs., 6 refs. [Istanbul] 1960. (With a summary in English.)

In the Çukurova district of Turkey, *Prodenia litura* (F.), the bionomics of which are described, has occasionally been noted on cotton towards the end of the season, but an outbreak occurred in 1960, as a result of the favourable conditions created by the introduction of an irrigation system. Good control was given by dusting with 10 per cent. DDT or a mixture of 3 per cent. γ BHC and 10 per cent. DDT (Cotton Dust) at 27 lb. per acre.

Avidov (Z.). **A study on the life history of the pomegranate butterfly** (*Virachola livia* **Klug.**) **in Israel.**—*Ktavim* (Engl. edn.) **8** no. 3–4 pp. 153–168, 2 figs., 5 refs. Rehovot, 1958.

Pomegranate is being increasingly cultivated in Israel but is infested by *Virachola livia* (Klug), which has long been known as a pest of the fruits in eastern Mediterranean countries [*cf. R.A.E.*, A **22** 234; **28** 271; **32** 85]. The life-cycle of the Lycaenid was therefore studied in the laboratory in

1953–56. Adults emerged throughout the year, though in reduced numbers in October–February and April–May. The annual mean ratio of males to females was 11:9. About 10 per cent. of the adults died within two days; of the remainder, males lived for averages ranging from 6·6 days in July–August to 15 days in November–December, and females from 7·7 days in May–June to 14·8 days in November–December. Less than a week elapsed before oviposition in June–September, but the period was extended at other times and reached a maximum of 26 days in March. The oviposition period increased from an average of three days in June to seven days in September, with a maximum of 10 days in July and August. Eggs were laid on the walls or bottoms of the glass containers, but in the open they are laid singly on the surface or sometimes on the coronet of the pomegranate fruit, and on green pods of *Acacia farnesiana*. No fertile eggs were laid in the laboratory, and the average number of sterile eggs laid per female increased from four in April to 35·5 in June, after which the number remained high until September. Death occurred about 1–2 days after the end of oviposition. Newly laid eggs collected in the field and transferred to the laboratory hatched in averages of 10·4 and 4 days at 20 and 28·5°C. [68 and 83·3°F.], respectively. The larvae bore into the fruits within 15 minutes of hatching, rejecting the rind, and completely enter them in about seven hours; many die in the process, the mortality percentage reaching 60·5 in pomegranates and 73·5 in *Acacia* pods in the laboratory. The number of pomegranate seeds eaten by a larva is not known, but in *A. farnesiana* 8–15 seeds are eaten, which may involve feeding in three pods. The average duration of the larval stage varied from 66·7 days at 15°C. [59°F.] for individuals hatching in November to 16·8 days at 28·5°C. for those hatching in August. About 50 per cent. of the larvae that pupated did so on the coronet and the remainder on the walls or floor of the cage, but in the field concealed places on the tree or beneath fallen leaves are chosen. The mean duration of the pupal stage varied from 67·6 days in winter at 15°C. to 8 days in June at 27°C. [80·6°F.]. Field observations in the Beit Shean valley in 1950–55 indicated that there were eight generations a year, but there are only six on the coastal plain, most damage to pomegranates being caused by larvae of the fourth generation in August. Severe infestation of the fruits ranged as high as 70·4 per cent. in one variety, but early and late varieties were less infested than mid-season ones. *Acacia* pods, though infested at times by all generations, were always infested by the first two and the last two, with peaks in early September, when the fresh pods set, and in October–November. The tree is of no economic importance in Israel, and its destruction as the primary food-plant of *V. livia* is recommended in areas suitable for pomegranate cultivation. Natural infestations of *V. livia* were also found on *Prosopis farcta*.

Avidov (Z.). **Population trend of the Egyptian black scale (*Chrysomphalus aonidum* L.) in the coastal plain of Israel.**—*Ktavim* (Engl. edn.) **8** no. 3–4 pp. 169–187, 8 graphs, 2 refs. Rehovot, 1958.

Chrysomphalus ficus Ashm. (*aonidum*, auct.) has long been regarded as a major pest of *Citrus* in Israel [*cf. R.A.E.*, A **25** 752, etc.] and is now present in most groves on the coastal plain north of Gedera. Population assessments were carried out at intervals from June 1955 to May 1956 on fruits and leaves on trees of grapefruit and Jaffa (Shamouti) and Valencia oranges in a grove at Rehovot and on leaves of artificially-infested saplings of the same trees and sour lemon grown in a screen-house with protection from sun and rain. The following is based on the author's summary of the results.

Populations on leaves in the grove reached peaks in November on Jaffa orange and grapefruit, and in February on Valencia orange, as compared with peaks in November on Jaffa fruits and in January on those of grapefruit and Valencia orange. Levels decreased rapidly in late winter, probably because of exceptionally high rainfall. They also decreased in August and October on Jaffa and Valencia oranges, respectively, and were low on Jaffa orange during the late winter months, and these periods are suggested as most suitable for the application of control measures. The scale had four generations a year. More than 70 per cent. of the live scales occurred on the lower leaf surfaces during the six hot months of the year, and 60–70 per cent. occurred on the upper surfaces during the other six months. In the screen-house, sour lemon lost only about 7 per cent. of its leaves during the year because of infestation, whereas the other plants lost as many as 37–57 per cent. A winter population peak in the screen-house was followed by a gradual decline in numbers until April–May, and this change in pattern from that on plants in the grove was attributed to protection from rain. It was also noticed that most crawlers in the screen-house settled on the lower leaf surfaces, except in September–October.

Swirski (E.) & Amitai (S.). **Contribution to the biology of the citrus rust mite** (*Phyllocoptruta oleivora* **Ashm.). A. Development, adult longevity and life cycle.**—*Ktavim* (Engl. edn.) **8** no. 3–4 pp. 189–207, 1 fig., 7 graphs, 12 refs. Rehovot, 1958.

Phyllocoptruta oleivora (Ashm.) has become a major pest of *Citrus* in Israel since its first reported occurrence there in 1944. Its life-cycle was studied in 1955–57 in the laboratory and in the field at Rehovot, and the following is based mainly on the authors' summary of the results. The theoretical threshold of development of eggs and nymphs is 9·2°C. [48·56°F.]. In summer, the two stages together lasted 4–6 days, but when the mean temperature dropped in winter to 11–12°C. [51·8–53·6°F.] they took up to two months. The maximum length of adult life at 12–18°C. [53·6–64·4°F.], at 20–23°C. [68–73·4°F.] and at higher temperatures was 36–37, 24 and 20 days, respectively. The death-rate was lowest at 16–18°C. [60·8–64·4°F.], high at 12–13°C. [53·6–55·4°F.], and increased proportionally with temperature above 20°C. There were at least 28 generations a year at Rehovot and at least 30 occur elsewhere in the coastal plain, in the Esdraelon Valley and in the Gaza strip, where the temperature never drops below that of the threshold of development, as occurs in Upper Galilee, where 26 generations are produced. At Rehovot, 2–4 generations occurred in January–March, which is the period when outbreaks begin.

Azim Zomorrodi (M.). **La lutte biologique contre la punaise du blé** *Eurygaster integriceps* **Put. par** *Microphanurus semistriatus* **Nees., en Iran.**—*Rev. Path. vég.* **38** fasc. 3 pp. 167–174. Paris, 1959. (With a summary in English.)

Eurygaster integriceps Put. is an important pest of wheat crops in Persia. Its eggs are parasitised by *Microphanurus semistriatus* (Nees) and *M. vassilievi* (Mayr), and the first of these Scelionids has been reared and distributed in infested fields for control of the bug since 1947 [*cf. R.A.E.*, A **47** 189, etc.]. The way in which this is done and the life-cycle of the host and parasite are described. Parasitism of up to 85–90 per cent. is sometimes achieved.

Ghouri (A. S. K.) & Salik (A. M.). *Adoretus versutus* **in West Pakistan.**—*FAO Plant Prot. Bull.* **8** no. 8 pp. 100–101, 5 refs. Rome, 1960.

Adoretus versutus Har., which is widely distributed in the Indian subcontinent but has not so far been recorded from West Pakistan, was observed damaging shade and ornamental plants in nurseries in Karachi in September–October 1957 and was common again in 1958. The bionomics of the Rutelid are described; the damage was due to the adults, which feed voraciously on leaves at night.

Outbreaks and new records.—*FAO Plant Prot. Bull.* **8** no. 9 pp. 113–114. Rome, 1960.

J. A. Whellan reports that *Pectinophora* (*Platyedra*) *gossypiella* (Saund.) was found on cotton in Southern Rhodesia for the first time in the lower Sabi Valley in late May 1959, and appeared to be restricted to the small cotton-growing area there. No evidence of long-cycle larval development was found, and winter is presumably passed on *Hibiscus dongolensis*, on which infestation was considerable. *P. gossypiella* was formerly present in Nyasaland [*cf. R.A.E.*, A **18** 423; **31** 353, etc.], but has not been found there of recent years.

Sudha Rao (V.) & Rao (V. P.). **Introduction of** *Prospaltella perniciosi* **for control of San Jose scale in India and Pakistan.**—*FAO Plant Prot. Bull.* **8** no. 10 pp. 120–123, 2 figs., 3 refs. Rome, 1960.

Prospaltella perniciosi Tower was imported into India from California in December 1958, reared on *Quadraspidiotus perniciosus* (Comst.) on pumpkin (*Cucurbita pepo*) in the laboratory by a technique described, and liberated against the Coccid on fruit and other trees at various localities, at several of which it became established. Consignments were also forwarded to Pakistan. In the laboratory, development was completed in 25–30 days at 80°F. and 50 per cent. relative humidity, and the adults lived for 8–12 or rarely 15 days. Two generations could be reared on each pumpkin, so that 1,000–1,200 parasites were eventually obtained from initial colonies of 100 per fruit.

Butani (D. K.) & Khanna (K. L.). **Comparative efficacy of various insecticides against sugarcane leaf hopper** (*Pyrilla*).—*Proc. 3rd bienn. Conf. Sug. Res. Dev. Wkrs Pusa 1957* pt. II pap. E. 18, 4 pp., 2 pls., 3 graphs, 4 refs. [?Pusa, 1958].

Prasad (S. N.) & Butani (D. K.). **Laboratory trials on the chemical control of sugarcane leaf hopper** (*Pyrilla perpusilla* **Walker**).—*Indian J. Sug. Res. Dev.* **1** pt. 4 pp. 197–201, 2 graphs, 4 refs. New Delhi, 1957.

Butani (D. K.). **Effect of endrin on the incidence of sugarcane leaf hoppers** (*Pyrilla perpusilla* **Walker**).—*Op. cit.* **2** pt. 4 pp. 204–207, 1 graph, 5 refs. 1958.

In the first of these papers on the control of *Pyrilla perpusilla* (Wlk.) on sugar-cane in India, an account is given of tests in the laboratory, in which five pairs of adults were placed on dusted sugar-cane leaves in glass jars,

and in the field in the following year, where ten pairs of adults were confined in small cages of mosquito netting on similarly dusted leaves. After 11 days, the dead adults were removed from the field cages and ten fresh pairs were introduced. The dusts used contained 2·5 per cent. dieldrin or 5 per cent. BHC, DDT or aldrin. In the laboratory, dieldrin gave the best results, mortality averaging 60 per cent. in one day, 90 per cent. in three and 100 per cent. in six and the mean length of life of the insects being 1·8 days, but all materials were significantly better than no treatment. In the field, dieldrin also gave excellent results, causing complete kill in eight days immediately after application and maintaining its effectiveness after 11 days better than the other materials, but BHC was about as good initially and is preferred for economic reasons. The dust should be applied at 20–25 lb. per acre.

In the second paper, dusts of BHC, DDT and toxaphene and sprays of these and of parathion were tested in an apparatus in which insects in cages were exposed for five minutes to fine clouds or mists. After treatment, they were supplied with sugar-cane leaves. The best result was given by 5 per cent. toxaphene dust, which gave complete kill in a week and permitted a mean survival period of 1·59 days. A dust of 5 per cent. BHC was somewhat more rapid in action but permitted a longer mean survival period, and a 5 per cent. DDT dust was also effective. The sprays were all inferior.

Large-scale tests in cane-fields with endrin at 0·1 lb. in 100 gal. emulsion spray per acre are described in the third paper. Areas of about 70 acres were treated at Motihari and Pusa in the third week of June 1955 and late September 1956, respectively, and counts were made before and three weeks after treatment. At Motihari, the percentages of infested leaves were reduced from 5·29–5·84 to 0·46–0·59, the average numbers of egg-masses per 100 leaves from 15·91–20·19 to 0·81–1·18 and the average numbers of eggs per mass from 34·59–37·01 to 17·75–20·26. At Pusa, the corresponding reductions were from 2·28–8·29 to 0·16–1·32, from 4·82–20·08 to 0·16–1·89 and from 18·46–26·89 to 10–21·36.

Kundu (B. C.), Basak (K. C.) & Sarcar (P. B.). **Jute in India.**—$11\frac{1}{4} \times 8\frac{1}{2}$ in., [15 +] 395 pp., 48 pls. (2 col.), 3 graphs, 14 charts, 1 map, many refs. Calcutta, Indian cent. Jute Comm., 1959. Price *Rs.* 30.

This book on jute (*Corchorus olitorius* and *C. capsularis*) and its cultivation in India includes a section (pp. 159–170) on the invertebrate pests of the crop, mainly insects, in which research on the bionomics and control of the more important species is reviewed [*cf. R.A.E.*, A **48** 314–315, etc.].

Dobrovol'skiĭ (B. V.). **The distribution of harmful insects. Foci and zones of greatest damage.** [*In Russian.*]—9 × 6 in., 215 pp., 65 maps, $20\frac{1}{2}$ pp. refs. Moscow, Gosud. Izd. " Sovetsk. Nauka ", 1959. Price 9 *rub.* 55 *kop.*

The greater part of this book consists of a discussion of the regional distribution of agricultural pests in the Soviet Union, the factors that determine it and the degree of damage, and the various regions and centres of damage that can be distinguished. The remainder deals with the distribution of harmful Coleoptera in the various regions.

Prints (Ya. I.). **Cultivation of European vines on their own rootstocks in Moldavia.** [*In Russian.*]—2nd edn., 96 pp., 17 figs., 2 graphs (1 fldg.). Kishinev, Gosud. Izd. "Kartya Moldov.", 1960. Price 1 *rub.* 20 *kop.*

European vines are grown on their own root-stocks in the Moldavian Republic, but soil fumigation against the root form of *Phylloxera vitifoliae* (Fitch) is recommended when they are planted in light clay soils, even though resistant varieties are used. In this booklet, the distribution of *P. vitifoliae* in Europe is reviewed, its cycle of development and the damage caused by the leaf and root forms are described and the use made of resistant varieties is discussed. Observations in Moldavia during 1947–49 are recorded, and progress made in the subsequent decade is described. Control of the root form of *Phylloxera* is still based on soil fumigation with carbon bisulphide, directions for the use of which are given, but good results have also been obtained with ethylene dichloride and other materials, including hexachlorobutadiene and 1,1,1,3-tetrachloropropane, which have been tested experimentally and found promising.

Wijbrans (J. R.) & de Weille (G. A.). **Rupsenbestrijding in de oliepalmcultuur.** [Control of caterpillars on oil palms.]—*Bull. Res. Inst. Sumatra Plant. Ass.* no. 15, 18 pp., 7 refs., multigraph. Medan, 1958. (With summaries in English & Indonesian.)

The following is based on the authors' summary. Oil palm [*Elaeis guineënsis*] in Indonesia is infested sporadically but severely by Limacodids, notably *Setora nitens* Wlk. The larvae are difficult to collect by hand, because of their urticating hairs. Sprays of lead arsenate were formerly applied for their control, but organic insecticides are now more commonly used and dieldrin has been found very effective. In tests, the best method of treatment proved to be by a machine that ejects a fine mist of water, containing an adhesive, into a cloud of dust as it leaves the pipe. The water in the cloud evaporates rapidly, leaving the adhesive, which improves the sticking capacity of the dust on the leaves. Mist blowers and power dusters were also effective.

The trees are also infested by Psychids, principally *Mahasena corbetti* Tams. They can be controlled by lead arsenate or organic insecticides, but are difficult to reach because of the protective cases in which they live. Good results were given by an endrin spray to which 0·5 per cent. alcohol had been added. This killed even the pupae and did not injure the trees.

Everett (P.). **The green vegetable bug.**—*N.Z. J. Agric.* **97** no. 5 pp. 469, 471–472, 3 figs., 3 refs. Wellington, N.Z., 1958.

Nezara viridula (L.) was first recorded in New Zealand in 1944 [*cf. R.A.E.*, A **40** 29]. Its economic importance appears to be limited by winter temperatures, and it is a major pest only in northern districts of the North Island, becoming progressively less important towards the south. Control measures are needed each year on commercial crops of tree tomatos, appreciable damage has been caused to some peach crops, and garden vegetables are extensively damaged in the north of the North Island, but control measures are unnecessary in the south and in the South Island (where the Pentatomid does not occur south of Marlborough Province), except in gardens. The introduced egg-parasite, *Microphanurus basalis* (Woll.), has been liberated against it each year since 1948–49, though in considerably

smaller numbers than during that season [**40** 30], and has become established [*cf.* **42** 210]. Although populations of *N. viridula* fluctuate greatly in different localities, they have not again reached the very high level reached in Northland in 1949. The fluctuations may result from the virtual destruction of a local population by the parasite, the consequent decline in that area of the parasite population, and recolonisation of the area by *N. viridula*, which appears to be more mobile than *M. basalis*. The Pentatomid is also attacked by native parasites, and poultry and pheasants are known to destroy it in large numbers. The evidence indicates that, although *M. basalis* can exert appreciable control in the warmer, coastal districts of Auckland Province, it cannot alone give satisfactory control anywhere in New Zealand.

Since 1950, a spray of 1 pint HETP [hexaethyl tetraphosphate] per 100 gal. has been extensively recommended for use on most garden plants except tomato, on which one of 1 lb. 50 per cent. wettable DDT per 100 gal. [*cf.* **40** 30] can be substituted. In recent years, sprays containing TEPP, malathion or lindane [γ BHC] are reported to have given satisfactory control.

Albrecht (F. O.), Verdier (M.) & Blackith (R. E.). **Détermination de la fertilité par l'effet de groupe chez le criquet migrateur** (*Locusta migratoria migratorioides* **R. et F.**).—*Bull. biol.* **92** (1958) fasc. 4 pp. 349–427, 20 figs., 65 refs. Paris, 1959. (With a summary in English.)

The following is based almost entirely on the authors' conclusions and English summary. The influence of crowding and isolation on *Locusta migratoria migratorioides* (R. & F.) was studied in the laboratory in Paris with reference to the relation between the degree of crowding and reproductive capacity of the female parents and the weight at hatching and number of ovarioles of the progeny.

Hatchling weight was shown to be influenced by the phase of the female parent or grandparent and by factors other than phase, such as the age and nutritional status of the parent female. In general, it varied inversely with the number of ovarioles present. Female hatchlings were significantly heavier than male, but the differences varied considerably from one egg-pod to another. When ovipositing females were crowded, the numbers of ovarioles that functioned during each cycle of reproduction, of eggs per egg-pod, and of egg-pods laid were all reduced in proportion to the degree of crowding. The average number of eggs laid per female was about 1,000 for isolated locusts and about 300 in populations of 200 per cage. Crowding also reduced the viability of the eggs; the proportion failing to hatch was increased from 7 per cent. of the total produced by an isolated pair of locusts to 20 at a density of 142 locusts per cage (about 33 cu. ft. in size). When the females were crowded only as hoppers, however, the number of egg-pods laid was almost doubled; the number of eggs laid per female was as high as 1,500 whereas under the reverse conditions it did not exceed 150. Crowding during oviposition also considerably increased the variability of the number of ovarioles in the progeny by an amount directly related to density, and it therefore appears that 'stress' caused by high density in the parental population extends to the developing embryo. The effects of crowding transmitted through several generations cannot be entirely attributed to natural selection, since so high a proportion of the hoppers survived that the margin provided by the range of variation in, for example, the number of ovarioles, was too small to allow it to operate. At least two non-genic processes seemed to be at work, of which one affects the

yolk, modifying the colour, size and hence developmental cycle of the progeny, and the other, more intimately linked with maternal 'stress', limits the number of embryonic ovarioles.

The effects of crowding can be seen even in a single breeding pair maintained together during adult life, since the ovariole number of the progeny is reduced by one in each successive egg-pod laid; the ovariole number in the progeny of a female removed from the male after 24 hours (a period that just permits pairing) remained constant. A smaller, but still significant, reduction in ovariole number took place in the progeny of females crowded as hoppers or immature adults. The extent of the difference between the average numbers of ovarioles in the progeny of crowded and of isolated females depends on the population density of the parents of the females. Those from crowded parents gave rise, if themselves crowded (20 per cage about 5 cu. ft. in size), to offspring with a mean ovariole number of 83, but, if they were reared in isolation, the number was increased to 103; the difference was halved when the maternal grandparents were isolated. Among the progeny of isolated females derived from crowded parents, each increment of 1 mg. in hatchling weight was accompanied by a mean loss of 2·85 ovarioles, whereas the loss was less than half this when the grandparents were also isolated. This regression of ovariole number on hatchling weight could be modified by changing the density of the parents only where the latter originated from a crowded population. The results of comparisons of this nature made between different egg-pods, whether laid by one female or several, differ from and were less precise than those made between progeny from a single egg-pod; egg-pods from different females differed no more than those from the same female. Values based on several egg-pods appear to be influenced much more by factors other than heredity; their variation was 67 times as great as that for comparisons within egg-pods when the stock from which the female parent originated was crowded and nine times as great when it was isolated. This inheritance of variability from the grandparents is in accord with that of phase characters, at least three successive generations being required to induce phase characters completely opposed to those of the initial breeding generation. Crowded females produce fewer hoppers than isolated ones, but they are larger and provided in the egg stage with greater food reserves. The total hopper mass per egg-pod is essentially the same (about 1 g.) whether the parents are crowded or isolated. It is conceivable that this redistribution of material, increased by successive consistently crowded generations, is associated with the relatively greater mobility of locusts in the gregarious phase.

CHAPMAN (R. F.). **Observations on the flight activity of the red locust, *Nomadacris septemfasciata* (Serville).**—*Behaviour* **14** no. 4 pp. 300–334, 16 figs., 16 refs. Leiden, 1959. (With a summary in German.)

The following is virtually the author's summary. From 1953 to 1956, observations were made on the flight activity of non-swarming populations of *Nomadacris septemfasciata* (Serv.) in the Rukwa Valley, Tanganyika [*cf. R.A.E.*, A **45** 497]. An attempt was made to obtain quantitative as well as qualitative data on flying locusts. Observations were also made of air temperatures and locust body temperatures, relative humidity, wind speed and light intensity.

No flight was seen at air temperatures below 18°C. [64·4°F.], and it is considered that the minimum permissive thoracic temperature for forced

flight was about 20°C. [68°F.]. Extensive spontaneous flying was common only at air temperatures of 29–35°C. [84·2–95°F.], being reduced at higher temperatures. Sustained flight usually occurred only in bright sunshine. Flight was seen at all relative humidities from 12 to 80 per cent., and a seasonal variation in the humidities at which flight occurred appeared to result from a close correlation of humidity with temperature. Marked displacement of whole populations was observed only when the saturation deficit was low. Extensive flying occurred only at wind speeds not exceeding 3 miles per hour, and in general, locusts that had fed recently flew less. The state of maturity also affected flight, which was least in fledglings and mature females. High-density populations flew in conditions considered unsuitable for flight in those of lower densities.

Fanning was seen to occur mainly at temperatures considered too low for flight. It was regarded as a response to stimulation in conditions that raised the threshold for flight. Take-off occurred in lulls in the wind and was probably initiated by a sharp rise in body temperature following the dropping of the wind. At higher wind speeds, the speed itself may be important. Other factors causing sharp temperature changes may also promote take-off. The movement of locusts from the roosts was associated with the first marked increase of body temperature relative to air temperature. It was regarded as a special case of take-off promoted by a sharp increase in temperature, all the locusts being similarly conditioned to temperature at this time of day. After moving from the roosts, the locusts were less active, the reduction in activity being associated with a period of feeding and also with temperatures relatively high for locusts conditioned overnight to low temperatures. Extensive flight started later in the day. In March–June, population displacement resulted, but later in the year the activity did not lead to marked displacements. The beginning of extensive flight was related to the end of feeding and possibly also to conditioning to higher temperatures. Late in the afternoon, the migratory flights became less extensive and led to roosting. This was always associated with falling body temperatures. Flight stopped at temperatures much higher than those at which it began. This was probably due to conditioning, as was the seasonal variation in the temperature at which the last flight occurred. Active feeding at this time may also have reduced flight.

Flight direction was studied, using the mirror method to provide quantitative data. Wind speed and direction were found to be important. At low wind speeds, the locusts were orientated predominantly upwind, at higher speeds predominantly downwind. The evidence suggested that the sun was not important in the determination of orientation, but that it might assist, through a sun-compass reaction, in maintaining a particular orientation despite short-term fluctuations in wind direction. Humidity probably played no part as a directing influence during these observations, but it could not be excluded as a possible factor in some circumstances. Landscape features were thought to be unimportant in orientation, except in so far as they affect wind speed and direction. The finer structure of the grasslands, however, probably elicited an optomotor reaction that made orientation to wind possible. Movements to and from the roosts were visually directed. Gregarious alignment helped to maintain a given orientation, while mutual stimulation promoted flight in high winds and so might be virtually responsible for a downwind orientation at high densities.

Displacements of the locust population were studied by marking and recovery methods. The results supported the conclusions drawn from the study of factors affecting flight direction. Locusts in low density moved into the wind. Having reached particular areas, characterised by large stands of *Echinochloa*, they became relatively static, and concentration resulted.

The high-density populations were displaced downwind, since they often flew in winds too high for upwind orientation on the optomotor theory. The build-up of swarm-density populations by "real" concentration of adults [*cf.* **28** 30] appeared to be a characteristic of *Nomadacris* in the Rukwa Valley.

COLLINGWOOD (C. A.). **The control of black currant gall mite in garden and nursery.**—*J. R. hort. Soc.* **84** pt. 3 pp. 133–136. London, 1959.

Cecidophyes (*Phytoptus*) *ribis* (Westw.), which causes big bud of black currant, is not well controlled by the traditional sprays of lime-sulphur. Recent work in England has indicated that sprays of endrin, fluoroacetamide or Thiodan are more effective, especially if applied after blossoming, when the mites have already invaded the new buds. Thiodan, the safest of the three, was not commercially available in Britain at the time of writing. The other two necessitate destruction of the crop if applied after blossoming time, because of residue hazards, and programmes incorporating their use are outlined. Dips of fluoroacetamide are useful for disinfesting cuttings.

GOULD (H. J.) & LEGOWSKI (T. J.). **Timing sprays for control of pea moth.**—*Agriculture* **65** no. 12 pp. 611–614, 1 ref. London, 1959.

A survey of pea crops in eastern England in the summer of 1957 having shown that growers were not obtaining control of the pea moth [*Cydia nigricana* (F.)] despite one or two applications of DDT, tests were carried out in 1958 to investigate the optimum timing of sprays [*cf. R.A.E.*, A **36** 263–264]. In the first, the insecticides were applied on 18th June, when the crop was in the late-flowering stage and infestation had not yet begun, and again on 4th July. At picking, on 29th July, the percentages of pods infested averaged 12·75, 13·5, 16, 16·75 and 21 on plots treated with 15 per cent. DDT emulsion concentrate at 13⅓ pints in 5 gal. water, the same quantity of DDT concentrate in 100 gal. water, and 20 per cent. parathion at 1½ pints, 32 per cent. dimethoate (Rogor) at 1 pint and 20 per cent. endrin at ¾ pint per 100 gal., respectively, as compared with 23·5 for no treatment. A third application of the dilute DDT spray on 18th July reduced the percentage to 6·75. This result was significantly better than all the others, and examination of the ages of the larvae present indicated that the third application of DDT was effective against the peak of the attack. In the second test, DDT applied on 24th June and 10th July resulted in 6 per cent. pod infestation on 29th July, as compared with 21·3 per cent. on untreated plots. It is concluded that flowering is not a safe indication for the timing of sprays against *C. nigricana*, and that attention should be paid to the presence of the pest in the crop.

COOREMAN (J.). *Tetranychus telarius* (**Linné**) (**Acari, Tetranychidae**) **parasite de la jacinthe d'eau** *Eichhornia crassipes* **Mart.**—*Bull. agric. Congo belge* **50** no. 2 pp. 395–401, 1 col. pl., 3 figs., 10 refs. Brussels, 1959. (With a summary in Flemish.)

Tetranychus telarius (L.), the synonymy and bionomics of which are briefly discussed, was observed in January 1959 infesting the tropical aquatic weed, *Eichhornia crassipes*, in laboratory aquaria in Belgium. Infested leaves became browned and their margins tended to curl inwards, due to the

increased evaporation brought about by the feeding punctures, and it is suggested that the mite might be of value in the biological control of *Eichhornia* in the Congo.

Proceedings of the Eighth Pacific Science Congress of the Pacific Science Association 1953. Volume IIIA. Oceanography and zoology.—pp. [2+] v 851–1643, illus., many refs. Quezon City, Nat. Res. Coun. Philipp., 1957. [Recd. 1960.]

The section of these proceedings dealing with zoology (pp. 1197–1643) contains the text of 41 papers read at the congress, of which the majority are concerned with insect pests and their control. Five are devoted to *Oryctes rhinoceros* (L.) on coconut in Malaya, the Philippines, Fiji and other Pacific areas, and four to fruit-flies and their parasites, and there are several papers on the distribution of other pest insects in Pacific territories and south-eastern Asia and their control by introduced natural enemies, one on the biological control of noxious insects and weeds in Canada, one on wireworms, another on the parasites of *Malacosoma* spp. and a third on spiders preying on *Choristoneura fumiferana* (Clem.) on Douglas fir (*Pseudotsuga menziesii* (*taxifolia*)), all in British Columbia, one on potato aphids in New Zealand, one on pests of rice in Hokkaido, Japan, and an annotated list of infectious diseases of insects in Hawaii.

Papers noticed by Title only.

Murayama (J. J.). **Description of** *Blastophagus* [*Myelophilus*] *khasianus*, **new species (Coleoptera: Scolytidae)** [from *Pinus insularis* (*khasya*) in Assam.]—*Bull. Brooklyn ent. Soc.* **54** no. 3 pp. 75–76, 1 ref. Lancaster, Pa., 1959.

Wallace (G. E.). **A new Pteromalid parasite** [*Cerocephala dubarae*, sp.n.] **of the eastern death watch beetle,** *Hadrobregmus carinatus* **(Say)** [in Pennsylvania].—*Bull. Brooklyn ent. Soc.* **54** no. 3 pp. 84–86, 3 figs. Lancaster, Pa., 1959.

Norman (P. A.) & Grant (T. J.). **Transmission of T_3 severe strain of tristeza virus of** *Citrus* **by the melon aphid** [*Aphis gossypii* Glov.].—*J. econ. Ent.* **52** no. 4 pp. 632–634, 1 fig., 14 refs. Menasha, Wis., 1959. [For shorter account see *R.A.E.*, A **47** 60.]

Jensen (J. A. S.), Petersen (H. N.) & Tauber (O. E.). **Confirmation by culture and staining methods of absence of symbiotic flora in** *Tribolium confusum* **Duval.**—*J. econ. Ent.* **52** no. 4 pp. 756–757, 5 refs. Menasha, Wis., 1959.

Shivashankara Sastry (K. S.) & Appanna (M.). **Parasites and predators of some of the common insect pests of sugarcane in Visvesvaraya Canal Tract, Mandya District, Mysore State.**—*Mysore agric. J.* **33** no. 3 pp. 143–153, 20 refs. Bangalore, 1958.

Wirjati. **A new species of** *Trionymus* [*oryzae*, sp.n.] **found on rice-roots in Java.**—*Idea* **12** no. 1 pp. 14–19, 7 figs., 15 refs. Bogor, 1959.

Schvester (D.). **Progrès dans la lutte contre la mouche de l'oignon (*Hylemyia antiqua* Meig.).**—*Rev. Zool. agric.* **57** no. 7–9 pp. 131–136, 2 refs. Talence, 1958. [A review of the literature.]

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